Barriers and opportunities in biodiversity governance: a feasibility assessment of strategies to reduce biodiversity loss

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Barriers and Opportunities in Biodiversity Governance

A Feasibility Assessment of Strategies to reduce Biodiversity Loss

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PBL Netherlands Environmental Assessment Agency

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Executive Summary

The 2010 International Year of Biodiversity drew attention to the ongoing loss of biodiversity as well as to the failure of existing governance instruments to meet the internationally agreed target of significantly reducing biodiversity loss. A recent study by the Netherlands Environmental Assessment Agency (PBL 2010a) has highlighted that many key pressures driving biodiversity loss could successfully be countered by the following **eight strategies**:

- expansion of protected areas,
- reducing deforestation,
- closing the agricultural yield gap,
- reducing post-harvest losses in food production and consumption,
- changing diets towards less meat-intensive consumption patterns,
- improving forest management,
- reducing marine fishing efforts,
- and mitigating climate change.

Some of these options have significant potential to reduce the key pressures on biodiversity, and many of them are technologically and economically highly viable. However, they are not always politically feasible at the international level. This potential trade-off between technical problem-solving and political feasibility at the international level is the starting point of this report. The study assesses whether, and to what extent, we can expect the eight options listed above to be agreed on and implemented by the international community in the form of an international agreement. This assessment is performed on the basis of the ModelGIGS framework (Dellas et al. 2011). This analytical framework identifies conditions or 'rules', taken from hypotheses provided by the scientific literature on international regimes, that indicate the likelihood of the formation and subsequent implementation of international environmental policies (so-called *international environmental regimes*). The rules that describe the likelihood of international cooperation and implementation of regulation are organized into distinct categories: *problem structure, negotiation process, actors, regime environment* and *regime design.* These rules are applied to the case of biodiversity.

To apply the ModelGIGS framework to the eight strategies mentioned above, the report identifies available instruments and policies that can be agreed on or implemented to address each option. Out of an array of available instruments, one is selected as most suitable for evaluation with the ModelGIGS framework, and where such an instrument does not exist, the report suggest an organization or policy process that could possibly take on the task. While only this option will be evaluated in this report, other instruments could be evaluated for implementing a specific option as well. However, for practical reasons, we have opted to analyze one instrument per option and not to evaluate several alternative instruments for a limited set of options.

Option 1: Expanding protected areas

Option 1 examines the implications of increasing protected areas to 20% or 50% of each of the currently defined 65 terrestrial ecoregions. Based on a review of existing instruments associated with the expansion of protected areas, the Convention on Biological Diversity (CBD) was selected for an examination of its potential to contribute to implementation of option 1. The analysis highlighted several favourable characteristics supporting regime implementation. Firstly, regarding the *problem*

structure, expanding protected areas has moderate regulation costs. Secondly, *actors'* interests and preferences seem to generally overlap, as notable non-participants in the CBD nonetheless still apply measures similar to the obligations of the convention. Thirdly, in terms of *regime design*, the availability of credible tools for scientific knowledge generation is supportive of successful implementation, as is the differentiation of rules to acknowledge differing capacities among countries. However, several aspects of regime design could also be improved to further increase the likelihood of regime implementation. Thus, while the CBD does contain several provisions for side-payments, more could be done to actually mobilize the promised funds. Furthermore, while the rules and obligations under the treaty, strategy and programs of work are precise, the indicators to measure compliance are in some cases incomplete and weak. Lastly, while regular reporting is possible, it is not mandatory, and the CBD lacks effective sanction mechanisms. Despite these obstacles, the conditions supporting regime implementation are generally very positive, and the overall feasibility of achieving the option of expanding protected areas through the CBD was evaluated as being **very high.**

Option 2: Reducing deforestation

The second option assumes that global forests will be protected from conversion from 2010 onwards. REDD+ was identified to be a suitable instrument for implementing such ambitions. However, as REDD+ has not formally been agreed on and implementation is currently limited to a number of pilot projects, the analysis focuses on the feasibility of regime formation (i.e. agreeing on a REDD= mechanism in the first place), rather than implementation as in the previous case. Application of the ModelGIGS framework reveals a number of barriers to international agreement on a REDD+ mechanism to protect global forested areas, but also identifies several opportunities. Regarding *problem structure,* the moderately high regulation costs are conducive to an agreement in this area. Secondly, during the *negotiation process*, the importance of side-payments was emphasized; furthermore REDD+ would not affect too many economic sectors directly, both of which are aspects encouraging regime formation. However, the barriers to agreement on REDD+ are significant. Firstly, the *problem structure* is not completely benign, as scientific uncertainty regarding several aspects of REDD+ remains high. The *negotiation process* also raises concerns, as asymmetry of interest between states remains high. However, these issues are not insurmountable, and can at least partially be addressed through more scientific research, differentiation of rules and side-payments. Overall, the possibility of agreement on a REDD+ mechanism, according to the ModelGIGS framework, is identified as **high.**

Option 3: Improving forest management

Another measure with considerable potential to reduce biodiversity loss is sustainable forest management, in particular by implementing reduced impact logging (RIL) practices and establishing plantations to supply global timber demand. With regard to this option, the analysis focuses on a slightly different form of cooperation than the previous options, as it was decided to focus on voluntary forest certification schemes. These were chosen for their focus on wood production for consumption, rather than forest protection from conservation as many other activities in this area do. Furthermore, the approach is different in that it evaluates both regime implementation (because voluntary certification schemes already exist to evaluate sustainable forest practices), and regime formation (as enhanced state cooperation in this area, for example by endorsing certification schemes, could increase their effectiveness). With

respect to implementation of existing certification initiatives, the focus was on aspects of *regime design.* Thus, one aspect that may hamper implementation is the lack of strong compliance mechanisms, while the existence of well developed systems for reporting and implementation review and relatively precise rules in many cases support implementation. In terms of the likelihood of increased cooperation in this area, conditions are also favourable in some areas. Thus, the low costs of implementation and high public concern are supportive (*problem structure).* Furthermore, the significant number of existing agreements, conferences and programs in this area also encourages cooperation and consensus-building (*regime environment)*. However, a significant barrier that needs to be overcome is the existing strong asymmetry of interest, based on the limited accessibility of certification for forest companies from some states and regions, which has also limited support for more cooperation in this field in the past (*actors, negotiation process).* Based on the ModelGIGS framework, it is possible to make some recommendations for ways to address such issues, in particular through differentiation of rules, and to a lesser extent, side-payments. However, in absence of rule differentiation and side-payments, the implementation of current certification schemes was identified as **moderate to high**, while barriers to increased cooperation in this area mean that the feasibility of regime formation was evaluated as **low to moderate**.

Option 4: Reducing marine fishing efforts

Overexploitation and depletion of marine fish stocks has substantial implications for marine biodiversity, therefore, a further option examined here is the possibility to restore fishing efforts to (near) maximum sustainable yield levels, immediately or over a ten-year period. Similarly to the previous option, the instrument chosen in this case was voluntary certification of sustainable fishing practices, different from many international agreements in this area, which often focus on particular fish species or oceans, marine certification can potentially be applied globally. For similar reasons as in the previous case, the evaluation of certification schemes also focuses on both regime formation and implementation. Concerning implementation of existing certification schemes, some of the shortcomings are that while they do have mechanisms for checking compliance, they cannot enforce sanctions, and in some cases, rules are insufficiently precise to allow adequate testing of compliance (*regime design*). However, concerning agreement on expanded international cooperation in this field, there are a number of opportunities. With respect to *problem structure*, it is very cost-efficient for states, as the most significant cost falls on the fisheries that are applying for certification. Furthermore, public concern for both eco-labelling and overfishing seems high, and scientific uncertainty is diminishing. The most substantial barrier to more cooperation in this field is the significant asymmetry in interest, which has in the past already blocked discussions on a government-led global certification scheme and reduced support for such an agreement by a number of states (*negotiation process, actors*). To some extent, these asymmetries (most notably between developing countries with predominantly small-scale fisheries on the one hand, and developed countries with large-scale fisheries on the other hand) can be addressed by differentiation of rules, a strategy that is already implemented by some fisheries certification schemes. A further development that could encourage more cooperation in this area is the implementation of side-payments: while these do not exist under the current certification system, FAO strongly encourages them. Overall, there are considerable barriers to enhanced cooperation in this field, although they can be overcome, leading to an evaluation of regime formation as **low** to **moderate**. Based on the existing fisheries certification schemes, implementation was evaluated as **moderate** to **high**.

Options 5 and 6: Closing the yield gap and reducing post-harvest losses

Two additional options to reduce biodiversity loss suggested in the PBL study (2010a) are increasing agricultural crop productivity and livestock productivity 40% and 20% faster than the trend, and reducing post-harvest losses in the food chain by 15% of total food supplies, corresponding to roughly halving food chain losses. These options are examined jointly, as the same organization – the Food and Agriculture Organization of the United Nations (FAO) – was identified as having the most expertise, authority and existing activities in both areas. Regarding the *problem structure,* scientific uncertainty is a substantial barrier towards greater cooperation in this area, in particular for improved agricultural productivity. However, the low regulation costs are a positive aspect of problem structure. Costs are low as current approaches to improvements in this area are limited to research and training seminars (e.g. on improved storage and handling to reduce post-harvest losses), although investments in technology innovation and transfer would be a highly desirable option in particular to increase agricultural productivity. Another impediment regarding problem structure may be the hesitant public opinion regarding some measures associated with increases in agricultural productivity, in particular genetic engineering. Furthermore, this issue is marked by asymmetry in state interests, which is also a significant impediment to agreement on cooperation. Generally, the feasibility of increased cooperation in this area was identified as **low**.

Option 5: Changing diets

Dietary change is another option that may have positive implications for biodiversity. Therefore, a further option that was considered is introducing a no-meat diet, or a low-meat diet. While there are currently no international agreements promoting dietary change, a potential forum through which international cooperation in this area could be increased and low-meat dietary guidelines and educational campaigns targeting a healthy diet could be launched is the World Health Organization (WHO). As the analysis indicates, discussions on the WHO *Global Strategy on Diet, Physical Activity and Health* also consider the possibility of including recommendations for a reduced consumption of certain animal products (although this was eventually dismissed on the basis of conflicting scientific evidence, economic interests and cultural differences), suggesting that future revisions of the WHO *Global Strategy* may again address this issue. Furthermore, regarding *problem structure,* the relatively low cost of this option would suggest an increased likelihood of revisions to address a low- or no-meat diet. Nonetheless, factors impeding such revisions are considerable. Thus, another aspect of *problem structure,* namely scientific uncertainty, is not necessarily favourable, as scientific evidence on consumption of animal products remains somewhat inconsistent and is far from accepted by all states. Furthermore, regarding the *negotiation process* and *actors*, the asymmetry of interest between states, based on the economic interests associated with the livestock sector, and the high diversity of states with regard to dietary cultures, are further impeding factors. Considering these factors and the prior experience of negotiating a *Global Strategy* incorporating recommendations on consumption of animal products, overall feasibility of increased cooperation in this area was assessed as **low/ very low.**

Option 8: Mitigating climate change

Climate change has significant implications for biodiversity. Thus, a vital option for reducing biodiversity loss would be greenhouse gas concentration stabilization at a level of 450 ppm (with or without bio-energy and increased agricultural productivity). The evaluation in this section focuses on the United Nations Framework Convention on

Climate Change (UNFCCC) and its Kyoto Protocol as the currently most applicable instruments in this field. Numerous factors affect the implementation of the current climate change regime, indicating issues that could be improved or built upon by a more ambitious successor agreement to the Kyoto Protocol. Two significant obstacles are the substantial regulation costs involved with implementing a successful climate agreement (*problem structure*), as well as the significant number of economic sectors affected by climate policies (*actors*). A further obstacle is the asymmetry of interest both between powerful and important states within the issue area, which is however to some extent addressed with differentiation of rules (actors, regime design). The interactions with other regimes, such as the world trade regime, are expected to have both negative and positive implications (*regime environment*). However, in terms of *regime design*, the UNFCCC and Kyoto Protocol incorporate various elements that have been identified as conducive to regime implementation. These include a relatively strong compliance mechanism, mechanisms for reporting and implementation review, and rules encouraging side-payments. Nonetheless, there is also room for improvements with respect to regime design: for example, the secretariat is identified as weak, and the voting system encourages broad and vague agreements. Overall, while the regime design is encouraging for implementation of climate change mitigation strategies through the UNFCCC and Kyoto Protocol, the impediments with respect to problem structure and actor interests are substantial, and furthermore the gap between the level of ambition of the obligations and the requirements of the option (GHG concentration stabilization at 450ppm) appears to be significantly larger than in most other options. Thus, implementation was evaluated as **moderate** to **high**. Nonetheless, the analysis indicates that while numerous issues could be improved on by a more ambitious successor agreement, the existing regime design can provide a useful foundation or inspiration.

Linking strategies

None of the options discussed in the PBL study (2010a) can halt biodiversity loss all by itself, and similarly the mechanisms and regimes to implement these options can only make a partial contribution to reducing biodiversity loss. However, the combination of certain strategies can lead to a much more significant reduction. Thus, the report also examines if, how, and to what extent the instruments to implement the various options can be combined. The option that appears to be most promising in this respect is REDD+, which touches on protected areas, climate change mitigation and sustainable forest management.

The ModelGIGS framework

The results presented in this report also allow a critical reflection on the assessment framework that was used, and in particular the drawbacks and uncertainties it raises that need to be resolved by future research. Most importantly, if an issue is characterized by predominantly positive attributes according to our framework, this does not mean it is highly visible on the international agenda. However, if policymakers focus on the issues with more favourable characteristics, they are more likely to reach an agreement or implement the solution. Furthermore, it may be useful to add more nuance to the framework once more variables become operationalisable, for example to better reflect the influence of non-state actors in regime formation and implementation. Additionally, while in its current form the framework assumes that each rule has the same influence, as the international environmental regime literature does not provide sufficient information on their relative weighting. Lastly, the framework does not indicate whether the instruments that are examined have a

beneficial impact on the problems they are trying to solve, as it focuses only on their output and outcome. Thus, in order to evaluate whether regime formation and implementation is worth pursuing, the potential impact of an option on the issue it aims to regulate also needs to be considered.

1 Introduction

There are multiple different definitions as well as a number of structural, functional and compositional aspects that have been associated with biological diversity, or biodiversity. These include genetic diversity, ecosystem variety, landscape processes, and many other aspects (Noss 1990; Pistorius et al. 2010). The Convention on Biological Diversity (Art. 2) defines biological diversity as "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems". However, while definitions may differ and focus on different components or qualities of biodiversity, indicators measuring the current state of affairs show the continuing loss of biodiversity.

1.1 Rethinking Biodiversity Strategies

A recent PBL study (2010a) examines the implications of the following eight policy options for reducing global biodiversity loss:

- *Expansion of protected areas*: Increasing the protected area to 20%, or 50% of all terrestrial eco-regions;
- *Reducing deforestation:* Protection of all forested areas globally from conversion from 2010 onwards;
- *Improving forest management:* applying sustainable forest management principles, such as reduced impact logging, to some or all tropical forests, and using plantation to supply 25 or 40% of global wood demand;
- *Reducing marine fishing efforts:* reduce fishing efforts to the maximum sustainable yield levels (possibly spread over a 10 year period), or reduce fishing efforts by an intermediate level between their current extent and MSY;
- *Closing the agricultural yield gap*: increasing agricultural productivity by 40%, and livestock productivity by 20% by 2050;
- *Reducing post-harvest losses in food production and consumption:* reducing losses in the food supply chain by 15% of total food supplies by 2050;
- *Changing diets towards less meat-intensive consumption patterns:* introducing a no-meat diet, or a reduced meat healthy diet;
- *Mitigating climate change:* stabilizing greenhouse gas emissions at 450 ppm, with or without bio-energy and improved agricultural productivity.

These options have significant potential to reduce the key pressures leading to biodiversity loss (see also figure 1.2). For example, growing and more affluent populations consume more food and in particular chose a more meat-intensive diet. One effect of this is greater agricultural expansion into natural areas, which threatens biodiversity. Increasing agricultural yields and limiting meat consumption could reduce the need for such expansion significantly. Of course, these eight options do not cover all the possibilities for reducing global biodiversity loss, for example, expanding marine protected areas is not included in any of the options, even though they are assumed to have significant potential to reduce losses in marine biodiversity. However, the reason these eight options were evaluated in the PBL (2010a) study and also considered in this report is that these are the issues that can be modelled most reliably, and where sufficient data is available to make estimates on their effect on biodiversity with a relatively high level of confidence. The technical potential of the

individual options compared to baseline development is presented in figure 1.1, while the combined impact of these options is presented in figure 1.2.

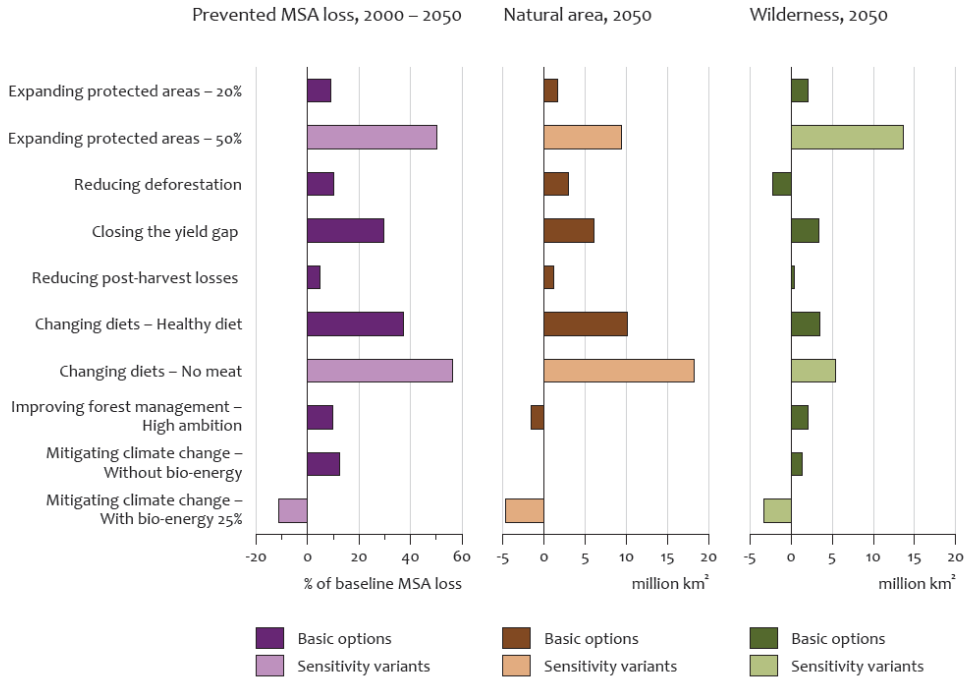

Figure 1.1 Changes in global biodiversity per option compared to baseline scenario (Source: PBL 2010a: 17)

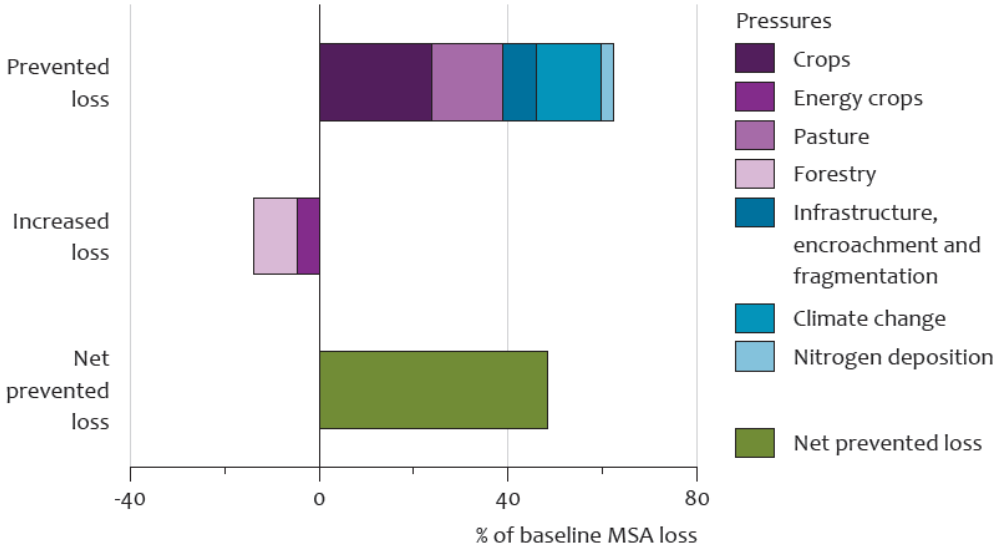

Figure 1.2 Prevented MSA loss of a combination of options compared to baseline scenario, 2000-2050 (Source: PBL 2010a: 12)

1.2 Aim and Research Questions

Many of the options discussed in the PBL study (2010a) are technologically and economically viable, but they are not always politically feasible. This potential conflict is the starting point of this report: to assess whether, and to what extent, we can expect the eight options listed above to be agreed on and implemented. This will be done on the basis of the ModelGIGS framework (Dellas et al. 2011), which examines regime formation and implementation of international regimes. The factors affecting regime formation and implementation outlined in this framework (referred to as 'rules') examine context and design variables related to problem structure, negotiation process, actors, regime design and regime environment. These rules are applied to evaluate the likelihood of a global instrument being adopted (where international cooperation to implement an option is thus far limited), or the level of implementation of those instruments that have already been agreed upon to address biodiversity loss. Thus, the aims of this report are to assess the existing conventions, targets and mechanisms that have been agreed on or are being discussed by governments, and to use the ModelGIGS framework to identify potential barriers and opportunities for international cooperation between governments.

2 Assessment Framework

Addressing many global environmental problems will call for deep behavioural, technological and institutional changes. Agreeing on and implementing such changes may be costly, and characterized by doubt regarding what the best measures and instruments facilitating change are. Based on a review of the literature on international (environmental) regimes, which provides a number of robust hypotheses on regime effectiveness, the ModelGIGS framework (Dellas et al. 2011) develops a number of 'rules' or factors that influence effective regime formation and implementation.[1]

The framework identifies conditions for effective regime formation and/or regime implementation in several key areas. First, the attributes of the environmental problem – here labelled *problem structure* – are influential. Each environmental problem has distinguishing features that define its degree of complexity and salience, and consequently, different problem types call for different solutions. Our conceptual framework concentrates on several characteristics of problem structure that potentially influence regime formation and implementation. The problem characteristics that are distinguished are collaboration problems, coordination problems, systemic environmental problems, cumulative environmental problems, public concern and regulation costs.[2]

Second, specific characteristics affect the context of actual international negotiation at conferences – we refer to this as the *negotiation process*. The negotiation process through which states agree on international cooperation is affected by the negotiation costs, whether and to what degree differentiation of rules occur, the availability of side-payments during the negotiations, and asymmetry of interest during the negotiations.

Third, the negotiation process affects and is affected by the constraints and autonomy of the negotiating countries and the ultimate targets (e.g. companies) of the envisaged regulations – labelled *actors*. The actor-related variables examined in this report include interest asymmetry, powerful states, number of economic sectors and homogeneity of states (as a determinant of conflicting or overlapping state interests) for the formation and implementation of regimes.

Fourth, regime negotiation and implementation does not occur in a vacuum: other institutions, organizations or norms in the wider international system influence both the negotiation process and the actors' preferences - labelled *regime environment*. This includes for example institutional interplay and the existence of preceding international agreements.

These four building-blocs represent the context variables for regime formation. If the conditions in each area are favourable, the likelihood of regime formation increases. During the regime implementation stage, some aspects of problem structure, actors and regime environment will still significantly influence the success of regime implementation. The negotiation phase, however, is no longer important. Instead, as a

[1] The full list of rules can be found in Dellas et al. (2010), as well as Annex A.

[2] Systemic problems are ones where the physical impacts of the problem are global, even though the activities causing it do not necessarily occur globally. Emissions of greenhouse gases are examples of systemic environmental problems: although the emission of these gases is asymmetrically distributed through at the world, they spread throughout the whole atmosphere (Turner et al. 1990). In comparison, cumulative problems are local in nature but widely replicated, consequently leading to widespread environmental change (ibid.). This includes changes to distinct local and regional ecosystems such as forests, grasslands and wetlands.

fifth and final category, the success of implementation also depends on different choices and components of the institutional structure – labelled *regime design*. Thus, a section of the ModelGIGS framework is dedicated to aspects of regime design, including scientific knowledge generation, compliance mechanisms, information and communication mechanisms, mechanisms for reporting and implementation review, and regime secretariats.

Based on the theoretical findings of regime literature outlined above, rules are developed that describe regime formation and regime implementation under certain conditions. These rules will be applied in this study to the case of biodiversity.

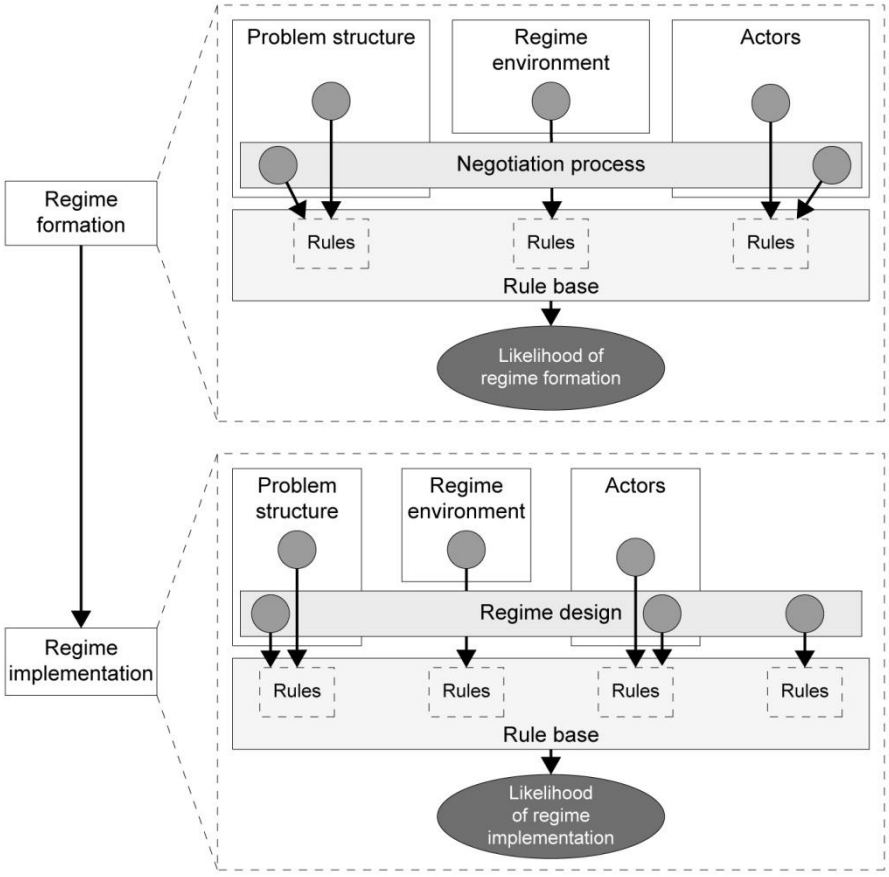

Figure 2.1 Factors affecting regime formation and implementation

2.1 Biodiversity: A Problem of Global Sustainability Politics

While biodiversity loss may appear to be a problem that is most easily addressed at a local or national level (for example through the traditional approach of establishing protected areas), a number of aspects associated with this problem indicate that a framework focusing on cooperation at the international level is appropriate for the issue of biodiversity loss, and that biodiversity loss is a global problem requiring global solutions (Swanson 1995). Firstly, many direct causes of biodiversity loss, such as deforestation or expansion of agricultural land, occur at the local level. However, they are so widespread that biodiversity loss is effectively a problem of global dimensions (Turner et al. 1990). Secondly, on a related note, while the exploitation of

natural resources within a state is often framed as an issue of sovereignty, in fact many species are migratory and many ecosystems are transboundary, good examples here are fisheries and forests (van Waarden 2010). Thirdly, many states or regions with high concentrations of biodiversity, or where it is particularly threatened, do not have sufficient financial resources to ensure its protection, while other states do (Heal 2002). And, lastly, many of the mechanisms that already exist to address the various issues associated with the options rely on at least some measure international cooperation. For example, mechanisms to address over-fishing require involvement by many actors, as unilateral commitments to fishing quotas are ineffective.

2.2 Applying the ModelGIGS Framework beyond International Regimes

While the focus of the ModelGIGS framework is on international regimes, it is suitable for application to other problems of international cooperation, as some of the same issues affecting regime formation and implementation also influence how likely other forms of cooperation are to be agreed on and put into practice. This is why we have chosen to explore the opportunities and barriers to international cooperation on implementing the strategies for reducing biodiversity loss outlined in the introduction.

Of course, while the instruments that the ModelGIGS framework was developed for - international regimes – are rather diverse, they are nonetheless comparable on many dimensions. In the case of the issues the ModelGIGS framework is applied to in this study, diversity is far greater: the selected instruments range from regimes, to voluntary certification schemes, to programmes that are currently still in development. In this situation, comparison is far less straightforward, despite the fact that each of these instruments is compared according to the same set of rules.

2.3 Selection of Cases

In assessing the feasibility of different options, the following structure is applied. The discussion of each option begins with an examination of the existing instruments and policy tools in each area, and identifies which of these is most suitable for evaluation according to the ModelGIGS framework. As this indicates, in areas where there are multiple examples of policies at the regional, national and/or global level, there is a need to justify why we consider one instrument more suitable for implementing the appropriate option, and apply the ModelGIGS framework to this instrument rather than others. While only one option will therefore be evaluated, in principle other instruments could be evaluated for implementing a specific option as well. However, for practical reasons we have opted to analyze one instrument per option and not evaluate several instruments for a limited set of options. Three considerations will guide this choice. First, where appropriate, instruments that are international are chosen over ones that focus predominantly on a national or regional level, considering the global dimensions of the ModelGIGS framework and biodiversity loss. Second, where multiple instruments exist that could potentially implement an option, the instrument with targets that are most congruent with the appropriate strategy/option is chosen (an overview of some organizations, agreements and partnerships etc. that work in each area can be found in figure 2.2 below). Of course, such instruments are not always available, and in many cases the mechanism that is discussed can only make a partial contribution to the aims of the option for reducing global biodiversity loss. Third, and on a related note, while in some areas there are multiple public or private, binding or voluntary instruments at national, regional or global levels, in some

other cases policies are rare. Where possible, the analysis will focus on binding, hard law instruments. However, where these do not exist, the focus will be on 'soft' instruments, such as guidelines or voluntary certification. And, in cases where such voluntary or soft instruments are also lacking, the report examines the possibility of adjusting existing mechanisms that are close to the focus area so that they could possibly include the option.

After an appropriate instrument has been selected, the rules of the ModelGIGS framework are applied to examine either the likelihood of regime formation (in the case of instruments that are not fully developed/where no agreement has been signed yet), or regime implementation (where an international regime or other alternative mechanisms have already been agreed on). Not all rules on regime formation or implementation will be applied in each case, as information availability for some of the rules and some options is limited.

Furthermore, while a higher number of positive evaluations regarding the conditions/rules specified in the ModelGIGS project indicate a higher potential likelihood of regime formation or implementation, this does not mean that currently significant attempts at regime formation or implementation exist in these areas. Indeed, while regarding some of the options, the rules indicate highly favourable conditions for regime formation or implementation, some of these issues are currently not garnering significant attention on international agendas. Thus, those options that are evaluated as having a relatively high likelihood of regime formation or implementation will not necessarily be successful in the near future. However, if governments, policymakers and international organizations focus on these issues in the near future, they may have a higher likelihood at regime formation or effective implementation than in those cases that face more obstacles.

2.4 Structure of the Report

Each section of this report provides a short summary of the main arguments, and an evaluation of whether the likelihood of regime formation or regime implementation overall is considered lower or higher. While comparison of the different factors is complicated by the diversity among the instruments examined in this report, we used a similar method to calculate the total score in each case so that the *overall* feasibility of regime formation and implementation can be compared. Therefore, although we cannot assign a fixed score for each regime, we can rank them relative to the other options presented in this report. Thus, where an issue was identified as an opportunity for regime formation or implementation, it contributed a positive mark to the overall score, while obstacles provided a negative mark. Rules that were not applicable, where insufficient information was available, or where the evaluation is ambiguous were considered neutral. In this way, a final outcome can be determined that indicates low to very low feasibility of regime formation/implementation (where obstacles outweigh opportunities), a moderate feasibility (if there is a balance between obstacles and opportunities), or high to very high feasibility (if opportunities outweigh obstacles). While it is possible that the different components that are evaluated vary in influence, this report assumes that each rule carries equal weight in determining likelihood of regime formation/implementation.

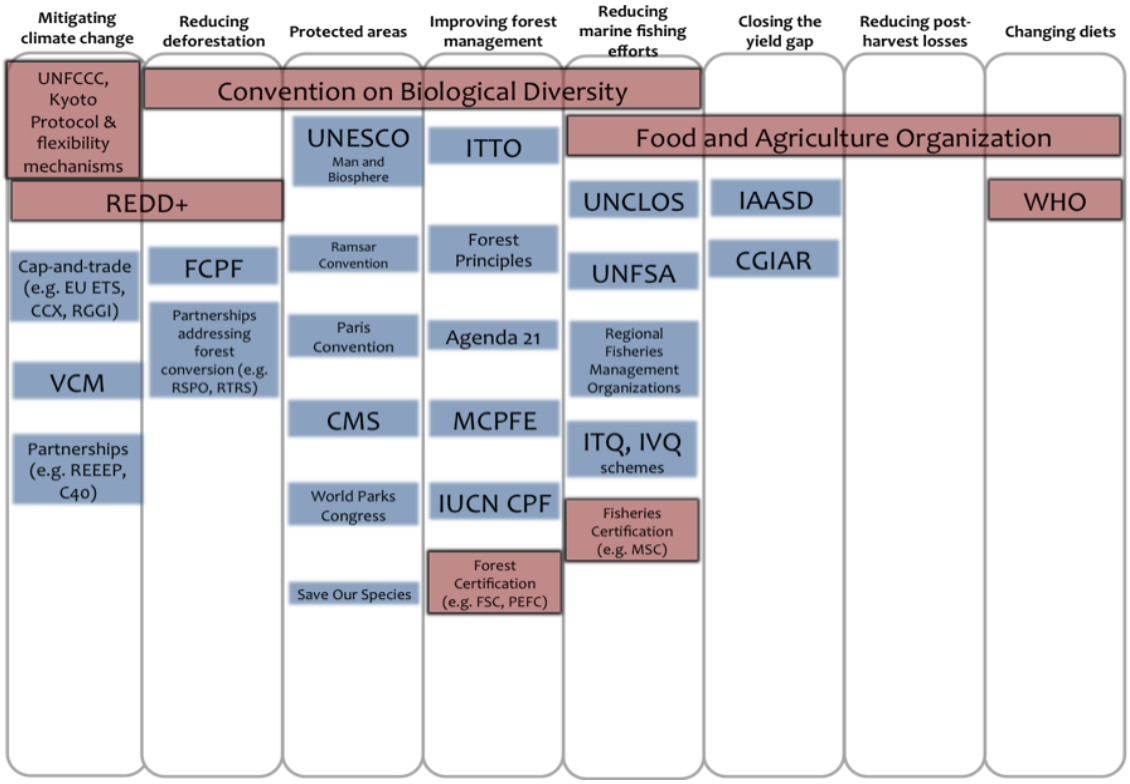

Figure 2.2 Several mechanisms and organizations working on issues related to the options for reducing global biodiversity loss. Red boxes indicate the mechanisms that are examined in this report.[3]

[3] List of abbreviations:
C40: Large Cities Climate Leadership Group
CCX : Chicago Climate Exchange
CGIAR: Consultative Group on International Agricultural Research
CMS: Convention on Migratory Species
EU ETS: European Union Emissions Trading Scheme
FSC: Forest Stewardship Council
IAASD: International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD)
ITQ: Individual Tradeable Quotas
ITTO: International Tropical Timber Organization
IUCN CPF: World Conservation Union Collaborative Partnership on Forests
IVQ : Individual Vessel Quotas
MCPFE: Ministerial Conference on the Protection of Forests in Europe
MSC: Marine Stewardship Council
PEFC: Programme for the Endorsement of Forest Certification Schemes
REDD: Reducing Emissions from Deforestation and Forest Degradation
REEEP: Renewable Energy and Energy Efficiency Partnership
RGGI: Regional Greenhouse Gas Initiative
VCM: Voluntary Carbon Market
UNCLOS: United Nations Convention on the Law of the Sea
UNESCO: United Nations Educational, Scientific and Cultural Organization
UNFCCC: United Nations Framework Convention on Climate Change
UNFSA: United Nations Fish Stock Agreement
WHO: World Health Organisation

3 Options for Reducing Global Biodiversity Loss: Expanding Protected Areas

Option 1

"Increasing the protected area to 20% of each of 65 terrestrial ecoregions"

"Increasing the protected area to 50% [of each of 65 terrestrial ecoregions" (sensitivity variant) [4]

3.1 Existing Instruments for Conservation

Multiple existing instruments or treaties aim to contribute to an expansion of protected areas. The following paragraphs outline some of these existing instruments. However, before entering into this discussion, it is necessary to point out that the ability of protected areas to contribute to reducing biodiversity loss also depends on the level of protection and enforcement. The calculations in PBL (2010a) that are examined here assume an increase of protected area coverage to 20% per terrestrial ecoregion, while allowing for displacement of pressure to non-protected areas (leakage) or to translate into higher prices or more intensive use of existing agricultural lands.

The Convention on Biological Diversity (CBD) encourages contracting parties to "establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity" and ensure adequate management of these protected areas (Art. 8). Several other CBD programs elaborate its work on protected areas in greater detail. In particular, they encourage the establishment of protected areas in a diversity of different ecosystems, including not only forests but also mountainous areas, inland water systems, dry and sub-humid lands, marine and coastal ecosystems. The CBD work on protected areas was also reaffirmed in the new Strategic Plan for 2011-2020: target 5 calls for at least halving the rate of loss of all natural habitats, and where feasible bringing it close to zero, while target 11 supports coverage by protected areas for terrestrial and inland, coastal and marine areas by at least 17 and 10 percent respectively.[4] In this sense, the CBD targets for protection of terrestrial ecoregions are rather close to the less ambitious variant of option 1, which is increasing protected areas to 20% of each of 65 terrestrial ecoregions. The second variant of 50% is not considered here. Firstly, it is highly unrealistic at the current time, as it goes far beyond current discussions and commitments on protected areas. Secondly, while this second variant would have significant benefits for biodiversity, the trade-offs with other issues would be more substantial. Thus, for example, the impact on agricultural production and food availability would be significant, and could lead to food deficits (PBL 2010a).

As the CBD is widely recognized as the most significant initiative in this area, other initiatives and treaties respond to its objectives, or even function as implementation instruments for these. One example is the Biosphere Reserves initiative under the

[4] Thus, if the strategic plan is implemented successfully, in some dimensions it actually goes beyond the option discussed here, for example by specifying clear targets for marine protected areas. As mentioned earlier in the report, while marine protected areas are recognized as having significant potential for the protection of marine biodiversity, they were not included in the *Rethinking Global Biodiversity Strategies* (PBL 2010a) report or this study due to the lack of available data for modelling of impacts.

UNESCO Man and Biosphere Program. Other global treaties addressing the establishment of protected areas include the Convention concerning the Protection of World Cultural and Natural Heritage (also known as the Paris Convention), which calls on each party to ensure "the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage [...] situated on its territory", and "set up within its territories [...] one or more services for the protection, conservation and presentation of the cultural and natural heritage with an appropriate staff and possessing the means to discharge their functions" (Art. 4 and 5). Furthermore, the Ramsar Convention on Wetlands of International Importance, especially as Waterfowl Habitat is an example of a treaty addressing the establishment of protected areas for specific ecosystems, as it encourages parties to designate at least one suitable wetland for the 'List of Wetlands of International Importance' and ensure their effective management. The Convention on the Conservation of Migratory Species (CMS) also works on protected areas, encouraging parties to work towards the "conservation and, where required and feasible, restoration of the habitats of importance" for species covered by the treaty and subsequent agreements (Art. 5e). Lastly, the World Parks Congress/ IUCN Global Protected Areas Program supports, on the one hand, the designation of at least 10% of the earth's surface as protected areas, and that all eco-regions are equally represented among these protected areas.

3.2 Selection of Instruments

Several of the instruments discussed above are notably less ambitious than even the less extensive variant of option 1, and therefore are less suitable for an examination of the feasibility of expanding protected areas with balanced ecoregion representation. The Ramsar Convention, for example, covers only one particular habitat, while the CMS focuses on areas that are of importance for particular (migratory) species. Thus, these conventions cannot ensure balanced ecoregion representation. Furthermore, the natural heritage sites covered by the Paris Convention do not necessarily have to be rich in biological diversity, other justifications include "exceptional natural beauty and aesthetic importance", or "representing major stages of earth's history" (UNESCO 2010a). Therefore even the natural heritage sites (which make up less than 23% of the protected sites) may not reflect the objectives of option 1. In addition, the convention does not specify a target minimum area of land to be covered by world heritage sites.

Based on these considerations, the most suitable instrument for addressing both aspects of the option for expanding protected areas is the CBD. As the CBD is an already established agreement, the following paragraphs will focus on the issues that may encourage or impede its effective implementation, as suggested by the ModelGIGS framework. According to this framework, regime implementation is influenced by the following factors: problem structure, actors, regime design, and regime environment.

3.3 Applying the ModelGIGS Framework to the CBD

Problem structure

According to the ModelGIGS framework, if the **costs of regulation** are very high, regime implementation is less likely.[5] In the case of protected areas, the cost of regulation differs significantly depending on the quality, status and effectiveness of the protected areas. However, high estimates of the cost of effective protection of

[5] Rule E2.

existing protected areas indicate an annual cost of up to nearly 8 billion USD (Bruner et al. 2004; James et al. 2001), although this cost will likely be higher with a substantial increase in coverage by protected areas. Nonetheless, this overall cost is likely to remain far lower than estimates for the regulation costs of some of the other options discussed in the following sections. For example, the cost of achieving greenhouse gas stabilization at 450ppm has been estimated at 1200 billion USD annually for greenhouse gas reduction (PBL 2009: 13). Thus, while funding of already existing protected areas in developing countries is "consistently less than what studies estimate to be adequate" (Bruner et al. 2004: 1121), overall regulation costs would not be a significant obstacle to implementing a more ambitious coverage of protected areas. At the same time, however, one must consider that simply because an issue is cheap to regulate does not mean that sufficient funding is available for this.

Furthermore, while the ModelGIGS framework only explicitly considers the cost of regulation, based on the focus of the literature on regimes, a consideration of costs of inaction or, alternatively, benefits of regulation suggests further incentives for regime implementation. Thus, protected areas provide significant values not only through the conservation of biodiversity, but also for example by supporting local livelihoods (TEEB 2009). Taking all the benefits of protected areas into account, their benefits may significantly outweigh those of alternative uses for the land, such as farming (TEEB 2009). Emphasizing such observations may be important for the mobilization of funding.

Actors

Two significant actor variables influencing regime implementation are: whether **all powerful states** participate in a regime, and whether **all states that are important for the issue area** participate.[6] In the case of the CBD, there are currently three countries that have not signed the convention: the United States, Andorra and the Vatican. Non-participation of the latter two is not significant for the implementation and expansion of protected areas. However, the fact that the United States has signed, but not ratified the treaty could have greater implications, as the US can be considered both a powerful state and an important state within the issue area (due to its vast territory and many different eco-regions). Therefore, continued non-participation by this actor could hamper progress towards increasing protected areas by 20% of all eco-regions. However, it has been argued that US non-participation is mostly based on the fact the CBD turned out not to be a pure conservation treaty (an idea the US strongly supported and that reflects existing measures in the US), but that it also addressed issues of "equity and economic development" (McGraw 2004: 11). In the former area, this non-participating state already has relatively strong policies, with for example 22.8% of its terrestrial and marine territory covered by protected areas and thus closer to the targets specified both in the CBD and the option than many other countries (see also the map in figure 3.1 below).

[6] Rules F2 and F3.

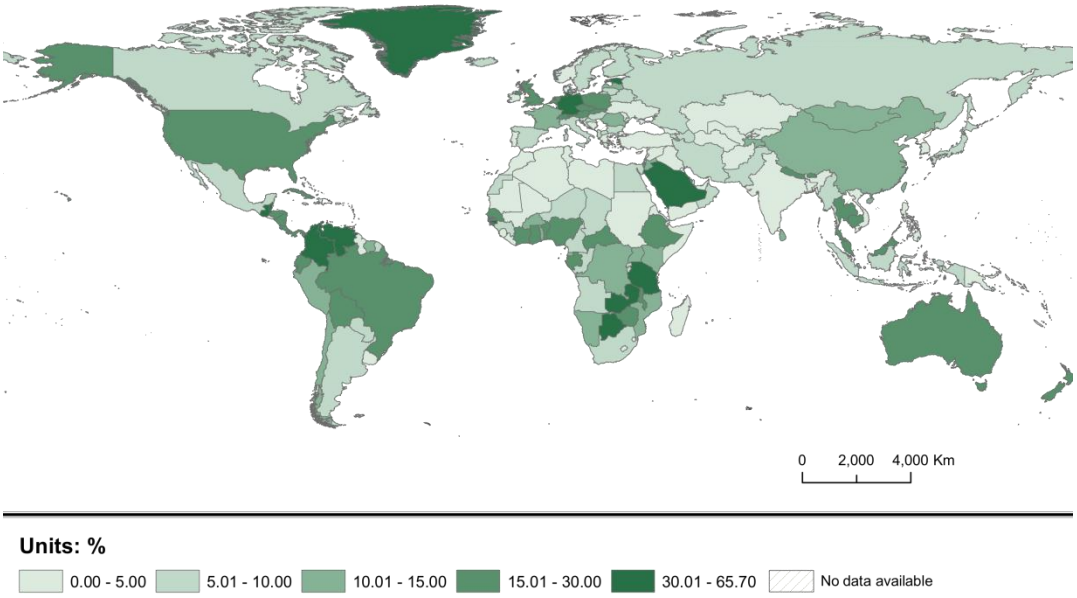

Figure 3.1 Proportion of terrestrial and marine areas protected in 2008 (Source: United Nations Statistics Division 2009)

Asymmetry of interest with respect to protected areas could also arise from the potential social, political and economic implications of establishing protected areas. For example, depending on how they are implemented, protected areas could lead to the displacement of communities, loss of access to land and resources (Agrawal and Redford 2009). However, expansion of protected areas does not necessitate deeper lifestyle shifts such as changes in production and consumption patterns.

Regime design

Regime mechanisms that increase **scientific knowledge generation, synthesis and dissemination** also support regime implementation.[7] The most significant mechanism for scientific knowledge generation in the CBD is the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), established by CBD Art. 25. An "important function of SBSTTA is thought to be the socialization of delegates of developing countries and industrialized countries alike into the science and norms of the regime", thus establishing consensual scientific knowledge (Le Prestre 2004: 85). Based on the scientific knowledge it produces and reviews, the SBSTTA has made more than 136 recommendations to the COP. The scientific information provided by the bodies of the CBD is "by and large seen as scientifically credible and politically neutral" (Siebenhüner 2009: 270).

Further important regime mechanisms for scientific knowledge generation include the Global Biodiversity Outlook, which is a regularly published synthesis of the current knowledge on biodiversity and biodiversity loss. Furthermore, the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES) will be a mechanism similar to the IPCC, and could contribute significantly by synthesizing the vast available scientific information in the area, as well as supporting credibility, consensual scientific knowledge and addressing knowledge gaps by conducting research (TEEB 2009). Considering these various mechanisms for scientific knowledge

[7] Rule G1.

generation, this can be considered a strong characteristic supporting regime implementation in the case of the CBD.

Furthermore, the ModelGIGS framework identifies **strong compliance mechanisms** as important for regime implementation in the case of collaboration problems.[8] Collaboration problems such as biodiversity loss are difficult to address because the incentives to cheat are strong, as it is not very visible in the short-term, while cheating is just as beneficial as cooperation in the short-term. In such cases, the ModelGIGS framework suggests that a strong compliance mechanism (a 'strong' mechanism is understood as one imposing sanctions in case of non-compliance) is likely to encourage more implementation (Dellas et al. 2011). However, in the CBD "sanctioning power is almost non-existent", as non-compliance does not lead to sanctions (Siebenhüner 2009: 278; Le Prestre 2004: 71). While compliance review is possible through the national reports (required by CBD Art. 26) and National Biodiversity Strategies and Action Plans (NBSAPs) which are the key implementation mechanisms of the CBD and its Strategic Plans (according to Article 6(a) of the Convention), several parties have not yet adopted NBSAPs (Prip et al. 2010: 1), and not all have handed in national reports, as will be discussed in more detail below. One reason making effective compliance mechanisms and sanctions problematic in the context of the CBD is the lack of appropriate indicators for some of the goals specified in the Strategic Plans. Without sufficiently precise indicators, it is difficult to adequately determine to compliance with some of the targets, possibly making implementation of the CBD somewhat less likely. Thus, as has been highlighted recently, the "the suite of internationally developed biodiversity and ecosystem service indicators is limited, and significant gaps exist", in particular regarding genetic or ecosystem changes (UNEP/IPBES/3/INF/2: 6). Indeed, currently only 9 out of 29 CBD indicators are considered well-developed (such that they are "based on established methodologies, have reasonable global coverage […] and for which there are sufficient time-series data […] to demonstrate changes over time") (UNEP/IPBES/3/INF/2: 7). However, in addition to IPBES, which will also contribute to indicator development once it is formally launched, several other partnerships and platforms also work in this area, such as the CBD-mandated Biodiversity Indicators Partnership (BIP). Thus, while indicator precision is currently lacking, considerable time and resources are being committed to improving this. **Side-payments** are a further aspect of regime design that makes implementation more likely.[9] In the case of the CBD, side-payments take several forms, such as financial assistance and technology transfer. Specifically, side-payments are included in the CBD under Articles 15 (governing access to genetic resources), 16 (access to and transfer of technologies), 18 (technical and scientific cooperation), and 19 (handling of biotechnology and distribution of its benefits). Article 20 furthermore emphasizes the financing responsibility of developed countries, which are obliged to provide developing countries with adequate financial support to meet the obligations of the Convention. Furthermore, pursuant to Articles 15 and 19 in particular, the Nagoya Protocol on Access and Benefit-Sharing emphasizes the fair and equitable sharing of benefits from the use of genetic resources. Overall, by focusing on far more than a traditional conservation approach, the CBD treaty ensures that "environmental and developmental interests were integrated to meet both the conservation interests of the North and the development interests of the South" (Siebenhüner 2009: 266). Thus, by including side-payments in several articles and subsequent agreements, the likelihood of implementation of the CBD may be increased. However, as was emphasized at COP-10, resource mobilization has in practice fallen short of its

[8] Rule G4.
[9] Rule G5.

ambitions, with many parties identifying a lack of resources and economic incentives as key reasons constraining implementation (UNEP/CBD/SP/PREP/1: 15-16). Similarly, while the CBD emphasizes policy mainstreaming as an important approach towards integrating biodiversity issues in other policy areas, in practice there is much left to be done, as is also indicated by the focus on improving policy mainstreaming in the new Strategic Plan and outcomes of COP-10 (PBL 2010b; UNEP/CBD/COP/10/27).

More **precise rules and obligations** are a further aspect of regime design increasing the likelihood of implementation.[10] The CBD is a framework treaty, thus it is a rather general document with no precise targets. However, the subsequent protocols, decisions and recommendations provide more specific information on protected areas. In the case of the CBD, greater precision also comes in the form of strategic plans, which provide clear targets and timetables. However, while there is little room for interpretation regarding these targets, the strategic plans and recent discussions at COP-10 highlight the need for more precise indicators (UNEP/CBD/SP/PREP/1: 18). Thus, the current set of indicators measuring progress to each target is sufficient to establish broad trends in biodiversity loss. However, as the Global Biodiversity Outlook 3 indicates, the degree of certainty is low or medium (or no indicators at all have been established) for 6 of the 15 indicators (CBD Secretariat 2010). Thus, precision of rules in the case of the CBD can be classified as intermediate.

Differentiation of rules is a further issue that is associated with a greater likelihood of regime implementation.[11] In the case of the CBD, differentiated rules are included to allow for the cost of implementing the obligations of the Convention according to capabilities. Thus, Article 20(2) puts on developing countries the responsibility to "provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfil the obligations of this Convention", Article 20(4) is an even more explicit differentiation of rules as it highlights that developing country parties are only obliged to implement their commitments to the extent that developed country parties implement their obligations to provide financial resources and technology transfer.

The likelihood of regime implementation is also increased by the presence of a **strong, autonomous secretariat**.[12] In the case of the CBD, it seems that the Convention Secretariat does not have a very significant budget, nor is it very autonomous, as it remains attached to the UNEP (while other treaty secretariats, such as the climate and desertification secretariats, are independent) (Siebenhüner 2009: 276). The implications of this attachment are that some important budgetary and staffing decisions, for example, are still often made by UNEP, although the secretariat has gradually increased its competences in these areas (Siebenhüner 2009). Despite this, the CBD secretariat is generally considered to be "small but effective" (ibid: 265). Indeed, in comparison to the secretariats of other treaties and international organizations such as the climate secretariat, for example, it stands out as having substantial cognitive and normative influence, by actively demonstrating its expertise, providing independent ideas and proposals (Biermann and Siebenhüner 2009: 328-333).

A further rule in the ModelGIGS framework is that **mechanisms for regular reporting and implementation review** increase the likelihood of implementation.[13] In the context of the CBD, important instruments for reporting to the CBD are national

[10] Rule G7.
[11] Rule G9.
[12] Rule G10.
[13] Rule G11.

reports. However, not all parties to the convention consistently provide these, with national reports having been submitted by less than 150 countries (out of 193 signatories) in 2010 (CBD Secretariat 2010). Specifically for the CBD program of work on protected areas, a mechanism for reporting and implementation analysis is the gap analysis, which requires countries to assess whether "a protected area system meets protection goals set by a nation or region to represent its biological diversity" (CBD 2007: 1), and implement the necessary measures to address any gaps. Furthermore, recent discussions at COP-10 indicate discussions on possible additional measures for implementation review, such as "voluntary peer review mechanisms" (UNEP/CBD/SP/PREP/1: 16).

Lastly, regime mechanisms that increase **public awareness** are also likely to increase regime implementation.[14] Overall, existing studies agree that public awareness for biodiversity remains low (Agrawal and Redford 2009; McGraw 2004; Siebenhüner 2009). A recent Eurobarometer survey indicates that at least among Europeans, familiarity with biodiversity is indeed low: only 38% of respondents were able to define biodiversity, and a further 28% had heard of it but did not know what it is (Gallup 2010). However, the respondents overwhelmingly considered biodiversity loss a fairly or very serious problem, with between 84 and 93% stating this in each country (Gallup 2010). Other issues (such as climate change) have attracted more attention in recent years, possibly because large catastrophes are more media attention-grabbing issues than issues such as species extinction (Agrawal and Redford 2009; Siebenhüner: 2009: 275). Nonetheless, the CBD is working to increase public awareness of biodiversity issues, for example through a communication strategy, education and public awareness programs, and improvements in the communication strategy were also highlighted at COP-10 in 2010 (Siebenhüner 2009: 270; UNEP/CBD/SP/PREP/1: 10-11).

As the discussion above indicates, applying the rules of the ModelGIGS framework (Dellas et al. 2011) suggests several aspects that may have positive or negative implications for the successful implementation of protected areas under the CBD. Regarding the positive aspects, firstly, the problem structure is rather conducive to addressing biodiversity loss: the cost of implementation is significantly lower than for many other options and instruments discussed in the subsequent sections of this report. Secondly, the actor interests and preferences seem to generally overlap, as even a non-participant such as the United States has done significant work to implement protected areas. And, thirdly, in terms of regime design, the availability of credible tools for scientific knowledge generation is supportive of successful implementation; as well as the differentiation of rules to acknowledge differing capacities among countries. However, several aspects of regime design could be improved to further increase the likelihood of regime implementation. Thus, while the CBD treaty does contain several provisions for side-payments, as the Nagoya negotiations highlighted more could be done to actually mobilize the promised funds. Furthermore, while the rules and obligations under the treaty, strategy and programs of work are precise, the indicators to measure compliance are in some cases incomplete and weak. Additionally, while the CBD does have a public awareness strategy, public awareness remains low. Lastly, while regular reporting is possible, it is not mandatory, and the CBD lacks effective sanction mechanisms. Nonetheless, overall feasibility of implementation of protected areas under the CBD according to the ModelGIGS framework remains very high. Additional factors that are not addressed by the framework rules also suggest this. For example, it seems plausible that one reason why protected area implementation has thus far reached much support and is likely to be more successful than other options is that they do not significantly interfere with

[14] Rule G14.

other socio-economic activities. Therefore, we can establish protected areas without requiring any significant behavioural changes or impinging on other policy areas.

Summary: Implementation of protected areas under the CBD

- Overall feasibility: **VERY HIGH**
- The conditions supporting regime implementation are generally positive. The problem structure is supportive, asymmetry of interest is limited, and regime design is conducive to successful implementation.
- Nonetheless, there is room for improvement in several areas. In particular, there may be a need to improve implementation of existing measures, such as side-payments. Furthermore, improvement of indicators would be beneficial. This would also support compliance.
- Lack of a strong compliance mechanism is the most significant barrier to successful implementation at this time.

4 Options for Reducing Global Biodiversity Loss: Reducing Deforestation

Option 2

"Protection of all forested areas globally from conversion from 2010 onwards"

4.1 Existing Instruments for Reducing Deforestation

Reducing emissions from deforestation and forest degradation in developing countries (REDD+) has long been recognized as a tool for limiting or reducing CO_2 emissions into the atmosphere. However, depending on how projects are implemented, they can also have substantial benefits for biodiversity, as well as other environmental or social benefits. Therefore, option 2 in the PBL (2010a) study examines the biodiversity implications of protecting all forested areas from conversion.

Momentum for including REDD+ in a post-2012 climate agreement has been increasing since 2005, where a submission to the COP by the Coalition of Rainforest Nations received wide support and prompted a closer examination of options and consensus potential with respect to REDD (Clarke 2010: 41), eventually leading to its inclusion in the Bali Action Plan. Furthermore, at the recent CBD COP10 meeting in Nagoya, the parties specifically affirmed the opportunities for REDD+ to preserve biodiversity values, if this is specifically monitored, and generally confirmed their support of a REDD+ mechanism in a post-Kyoto agreement, however also noting the importance of sufficient biodiversity safeguards to ensure that REDD+ does have positive benefits for biodiversity (Jungcurt et al. 2010: 20). In December 2010, the Cancun Agreements adopted by the UNFCCC COP16 provided positive signals regarding REDD+, although many questions, for example regarding its long-term financing, still need to be resolved (Akanle 2010).

Addressing deforestation has also been a topic in discussions by the context of the ad-hoc Intergovernmental Panel on Forests (IPF) and Intergovernmental Forum on Forests (IFF), as well as the permanent UN Forum on Forests (UNFF) (Dimitrov 2003). Many of these discussions have a much broader focus on sustainable forest management, and are therefore discussed in greater detail in chapter 3.3.

In the absence of a binding international mechanism involving REDD+, a number of voluntary frameworks for the implementation of pilot and demonstration REDD+ projects have also evolved. For example, The UN-REDD Program supports the implementation of pilot REDD+ projects in nine countries, while the recently established interim REDD+ partnership serves "as an interim platform for partner governments to take immediate action to scale up REDD+ actions and finance, while a future mechanism under the UNFCCC is negotiated and implemented" (ENB 2010: 1). Additionally, the World Bank's Forest Carbon Partnership Facility (FCPF) supports the development of REDD+ policies in forested countries in Africa, Latin America and the Caribbean, Asia and the Pacific region. The FCPF also intends to provide payments for emissions reductions from these pilot REDD+ programs (FCPF 2010). Many other organizations support and fund such demonstration activities, among others including the Global Environment Facility (GEF) and the REDD-plus Interim Partnership (UNEP/CBD/WS-REDD/1/2: 6). Projects to reduce emissions from deforestation and

degradation are also implemented by some project developers on the voluntary carbon market.

Additionally, a number of partnerships, certification and standard organizations, treaties, and programs of international institutions include protection of forests and/or woodlands in their objectives. One example is the Round Table on Sustainable Palm Oil (RTSP), a public-private partnership encouraging sustainable palm oil through certification, which has criteria for sustainability that "include no conversion of primary forest to oil palm plantations after November 2005" (CBD Secretariat 2006: 67). The RTSP has inspired similar initiatives, such as the Round Table on Responsible Soy (RTRS). The CBD also addresses forest protection with its work program on Forest Biological Diversity, which specifies criteria to "Reduce threats to forest biodiversity, [...] protect, recover and restore forest biodiversity, [...and] promote the sustainable use of forest biodiversity" (CBD Secretariat 2006: 48).

4.2 Selection of Instruments

As a future REDD+ mechanism will potentially lead to the protection of a far greater number of forested areas globally than e.g. initiatives such as the RTSP, the factors constraining or supporting agreement on cooperation in this area will be examined here. Of course, the exact design of REDD+ is likely to have substantial implications for the extent of its positive (or negative) impact on biodiversity, for example depending on the extent to which conversion of high biodiversity forests into plantations and use of invasive alien species are avoided, or conversely if a focus on areas that are degraded and/or of low biodiversity value or composed of non-native species is encouraged (UNEP/CBD/COP/10/3).

As the option outlined in PBL (2010a) focuses on the prevention of conversion of natural forests and does not include plantations (while the option on sustainable forest management does), it is assumed that REDD+ will not include plantations.[15] The option in PBL (2010a) does allow for leakage to other, non- or less-forested biomes, highlighting the importance of interactions between options. Thus, for example, increasing agricultural productivity is important, as it may prevent forest clearing from shifting to areas not covered by REDD (PBL 2010a, 2010b).

However, it is important to note that irrespective of the actual characteristics, a REDD+ mechanism is unlikely to lead to protection of all forested areas, as specified in the option. Furthermore, the option assumes protection of all forested areas from 2010 onwards, which is also not feasible. Thus, this mechanism will only make a partial contribution towards meeting the target.

In difference to the discussion on protected areas in the previous section, there is no formal international cooperation on REDD+ yet. Thus, rather than examining regime implementation, the following paragraphs will apply the rules from the ModelGIGS framework on regime formation to identify what issues may impede or encourage international cooperation on the protection of forested areas. The rules on regime formation cover issues such as problem structure, actors, negotiation process, and regime environment.

[15] Although the COP10 document highlights that plantations were not considered completely undesirable – they could function as a bridge between fragmented areas of high biodiversity value, and take the pressure off areas of high biodiversity value if no conversion occurs for plantations, it focuses on native species etc.

4.3 Applying the ModelGIGS Framework to REDD+

Problem structure

The **cost of regulation** is one issue that affects the likelihood of regime formation.[16] Implementing REDD+ is by no means cheap: for example, implementing REDD+ so that deforestation rates are halved by 2030 could cost between 17.2 and 33 billion USD annually for a reduction of deforestation by 50%, the cost of protecting all forested areas from deforestation will be even higher (Eliasch 2008). However, accurate estimates on the eventual costs of REDD+ are difficult to make without details on the final design of this mechanism and a number of other factors, such as the carbon price, whether or not the areas most at risk for deforestation are effectively targeted, and to what extent leakage is avoided. At the same time, this still implies that REDD+ is far less costly than implementation of some of the other options, such as climate change mitigation in particular. Furthermore, studies highlight that while REDD can have significant long term benefits of up to USD 3.7 trillion, delayed action in this area would drastically reduce these benefits (Eliasch 2008; TEEB 2009). However, while the cost of REDD+ is moderate, discussions on REDD+ occur in the context of the UNFCCC, which is likely to lead to significantly more costly agreements to address climate change, as is outlined in the discussion on climate change mitigation. Linking REDD+ to this more costly process may limit the benefits of its moderate costs. Conversely, it may also be beneficial for agreeing on a REDD+ mechanism, since it is a cheaper alternative to many other climate change mitigation options, possibly making it more attractive in comparison and thus speeding up agreement. Other considerations regarding the cost of REDD+ involve the socioeconomic costs: "forest utilization is a cross-sectoral issue that involves a number of economic and broader social interests" (Dimitrov 2003: 144), and similarly to the expansion of protected areas discussed in the previous section, forest protection through REDD+ may imply loss of income or livelihoods for local communities.

Scientific uncertainty also decreases the likelihood of regime formation.[17] With respect to REDD+, discussions remain far from consensual and scientific uncertainty remains high despite long and ongoing research and discussions on this issue. For example, while there have been many improvements regarding monitoring, in particular monitoring of forest degradation is still problematic via conventional tools such as satellite images, and furthermore scientific methods to adequately quantify the reduction of biodiversity loss by REDD+ are lacking (Clarke 2010; Pistorius et al. 2010). With respect to the implications of REDD+ for biodiversity, other issues that have been highlighted include "the possible creation of perverse incentives that would undermine biodiversity objectives, notably by subsidizing or otherwise facilitating the conversion of primary or other naturally regenerated forests" into plantations (UNEP/CBD/WS-REDD/1/2: 14). Indeed, while a REDD mechanism has been on the agenda since the Kyoto Protocol negotiations in 1997, it was not included in the final agreement "primarily because the technology to estimate forest carbon stocks, monitor deforestation and calculate emissions reductions was not considered sufficiently advanced" (Clarke 2010: 41). Nonetheless, recent studies also highlight the significant progress that has happened in this area and that the trial implementations have also increased certainty regarding some issues.

[16] Rule A1.
[17] Rule A5.

Negotiation process

With collaboration problems, **side-payments** make regime formation more likely.[18] This is one aspect that makes agreement on a potential REDD+ mechanism more flexible, as REDD+ and supporting developing country capacity to implement REDD+ projects is associated with substantial revenues (Harvey and Dickinson 2010) in the form of investments, technology transfer, and capacity building. However, an issue that remains unsolved is how, exactly, this funding will be mobilized.

Actors

Two issues that increase the possibility of regime formation include **widespread support** by **powerful states**, and by **important states within the issue area.**[19] However, although discussions on a REDD+ mechanism have been ongoing for a number of years, most recently in Copenhagen parties were also not able to agree on more than an 'accord'. While the Copenhagen Accord highlights that its signatories "recognize the crucial role of reducing emission from deforestation and forest degradation (…) and agree on the need to provide positive incentives to such actions through the immediate establishment of a mechanism including REDD-plus" (FCCC/CP/2009/L.7: 2), the failure to actually agree on an adequate framework for these incentives indicates lacking support by powerful and/or important states within the issue area. However, it has been emphasized that while support for REDD+ may vary between states, the failure to reach agreement at Copenhagen was much more related to the breakdown of the wider UNFCCC process (Clarke 2010). Nonetheless, the importance of widespread support for REDD+ not only for a successful agreement, but also its implementation, is highlighted by the fact that if not all countries participate in REDD+, the possibility of leakage increases, as deforestation may simply shift to those countries that do not support REDD+, and as deforestation may shift from high carbon density forests recognized under REDD+, to lower carbon density forests that are not included (Harvey and Dickinson 2010: 13).

Regime environment

Regarding the regime environment, one issue that increases the likelihood of regime formation are **scientific advisory bodies, providing consensual scientific information on the issue**.[20] Building a scientific consensus on REDD has been emphasized since it first received substantial attention at COP11. Since then, the UNFCCC Subsidiary Body on Scientific and Technical Advice (SBSTA) has worked on evaluating options for REDD, and conducted high-level workshops to help build consensus (Clarke 2009: 41). These developments indicate that, despite persistent scientific uncertainty, scientific advisory bodies are working to remedy this situation.

As the analysis above indicates, applying the rules of the ModelGIGS framework (Dellas et al. 2011) suggests several opportunities and barriers to international agreement on a REDD+ mechanism to protect global forested areas. One opportunity is that while the estimated costs of REDD+ are not insignificant, they are also not unmanageable and remain far below the cost of several other strategies outlined in this report. A further aspect supporting agreement on REDD+ is that during the negotiation process side-payments were heavily emphasized, as REDD+ requires financial transfers from developed countries to developing countries for the protection of their forests. Implementing REDD+ would also not affect too many economic sectors directly, which

[18] Rule B4.
[19] Rules C5 and C6.
[20] Rule D2.

also makes agreement more likely. However, the barriers to agreement on REDD+ are significant. Firstly, there is still considerable scientific uncertainty surrounding REDD+, and in particular the biodiversity aspects of REDD+. Thus, further work is needed to define suitable ways to measure and monitor biodiversity in REDD+ forests. Secondly, and on a related note, scientific information on REDD+ is not necessarily consensual, although this will more likely be addressed with further reports from scientific bodies, refinement of methodologies and criteria. And, thirdly, asymmetry of interest between important states within the issue area and/or powerful states is significant, although this issue is to some extent addressed by the differentiation of rules and responsibilities. Thus, although there are barriers to agreement on REDD+, these are not insurmountable: they can at least to some extent be addressed by further research, and trial implementation REDD+ projects also provide ongoing input on suitable methodologies and criteria.

Summary: agreement on a REDD+ mechanism

- Overall feasibility: **HIGH**
- While there are some barriers to an international agreement on REDD+, they are not insurmountable. Barriers such as scientific uncertainty and asymmetry of interests between developed and developing countries can at least partially be addressed by more research by the many scientific advisory bodies working on this issue; as well as differentiation of rules and side-payments, respectively.
- Furthermore, several factors encourage regime formation in this area. These include the moderate cost, side-payments, and the low number of economic sectors affected.

5 Options for Reducing Global Biodiversity Loss: Improving Forest Management

Option 6

"Moderate ambition option with partial RIL practices in tropical forests and establishing plantations to supply 25% of global wood demand by 2050"

"High ambition option with full implementation of RIL practices and establishing plantations to supply 40% of global wood demand" (sensitivity variant)

5.1 Existing Instruments for Sustainable Forest Management

Another measure evaluated by PBL (2010a) with respect to its potential to reduce biodiversity loss is sustainable forest management. In particular, the study considered the implications of implementing forest management practices with different levels of ambition, as indicated in the text box above.

Multiple international programs and institutions have worked on the formulation of common principles and commitments on improved forest management, although the implementation of these commitments remains limited (Visseren-Hamakers and Glasbergen 2007). The International Tropical Timber Organization (ITTO) is credited with initiating the concept of sustainable forest management it is currently used (UNEP/CBD/WS-REDD/1/2). This was supported, endorsed and expanded by the Forest Principles and Chapter 11 of Agenda 21, which were adopted at the 1992 United Nations Conference on Environment and Development (UNCED). Following UNCED, further discussions with the intention of facilitating agreement on an international mechanisms dealing with forests were held in the context of the Intergovernmental Panel on Forests (IPF), and later on the Intergovernmental Forum on Forests (IFF). However, states failed to reach consensus on the type and content of the agreement in either of these ad-hoc forums, so rather than a binding international agreement their final outcome was the permanent UN Forum on Forests (UNFF) (Dimitrov 2003: 136). The CBD also addresses sustainable forest management in its work program on "Forest Biological Diversity". This addresses the establishment of protected forest areas, but also works on issues relating to sustainable forest management, as well as assessment and monitoring. The CBD has also worked towards refining the criteria and indicators for sustainable forest management and promoting their application (e.g. COP decisions VI/22 and VII/1). At the regional level, the European Ministerial Conference on the Protection of Forests in Europe (MCPFE, also called FOREST EUROPE) is active in establishing guidelines for the European Union and the 46 member countries, as well as promoting implementation of sustainable forest management practices. In the European Union, another initiative affecting forest management is the Forest Law Enforcement, Governance and Trade (FLEGT) process. FLGET targets illegal logging and trade of illegal timber, by developing "voluntary agreements with the producer countries that provide the largest amounts of timber for the European market", which then only allows timber with a legality license on the market (Visseren-Hamakers and Glasbergen 2007: 414). Similar processes addressing illegal logging also exist in other regions, such as Africa and East Asia (Visseren-Hamakers and Glasbergen 2007). At the same time, such environmental measures in the forest sector may constitute non-tariff trade barriers, which is why the WTO has also taken an interest in developments regarding sustainable forest management principles and their application.

Another forum for the application of SFM criteria is REDD+, as SFM is one of the additional activities that are under discussion for inclusion in a REDD+ mechanism. However, this option will not be considered for greater examination in this section, as the potential for regime formation in this area is already discussed in more detail in chapter 3.2. Furthermore, if REDD+ is to contribute to the protection of biodiversity, it would ideally exclude plantations, as was emphasized by expert workshops on REDD+ in Nagoya (UNEP/CBD/WS-REDD/1/2). A REDD+ mechanism focusing primarily on forests as carbon stocks and not biodiversity could encourage the conversion of natural forests into plantations, thus undermining the possible positive outcomes for biodiversity from REDD+ (ibid.).

Other working groups, partnerships and agencies have also been active in this field, such as the IUCN, the Collaborative Partnership on Forests (CPF), and various business initiatives or public-private partnerships, such as voluntary forest certification schemes. These schemes support criteria that reflect sustainable forest management strategies, in some cases also explicitly endorsing and applying the SFM criteria defined by intergovernmental agreements of the MCPFE, ITTO and African Timber Organization (ATO) (e.g. PEFC 2009). Examples of voluntary certification schemes are the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification Schemes (PEFC). As such certification schemes may also certify plantations, they are closer to the option discussed in this section, which explicitly examines the value of establishing highly productive forest plantations on abandoned agricultural lands to cover global demand for wood and reduce loss in natural forests (PBL 2010a). Thus, these certification schemes also differ from partnerships such as the RSPO and RTRS discussed under section 3.1.1, as the latter are primarily aimed at preventing conversion of natural forests, whereas certification schemes address the issue of sustainable logging (Visseren-Hamakers and Glasbergen 2007).

5.2 Selection of Instruments

While commitments toward sustainable forest management have thus been made under multiple agreements and statements, implementation remains limited. However, substantial work on implementing sustainable forest management practices has occurred in the context of voluntary forest certification. Furthermore, while certification of plantation forests and plantations in general remain controversial and face opposition, many certification schemes have now accepted that “fast growing plantations could play a role in reducing demand elsewhere and minimize environmental impacts” (Bernstein and Cashore 2007: 360; Cashore 2002: 518). However, to avoid negative implications for biodiversity from plantations, forest certification schemes generally include criteria specifying that plantations should not increase pressures on natural forests, and that natural forested areas should not be replaced with plantations, which may produce more wood but are of lower value for biodiversity. For example, the FSC principle 10.2 specifies that “the design and layout of plantations should promote the protection, restoration and conservation of natural forests, and not increase pressures on natural forests”.

Thus, while previous sections have predominantly focused on using the ModelGIGS framework to evaluate (potential) cooperation between states on the options to reduce biodiversity loss, this option will explore cooperation from a different angle: what factors encourage or hinder the expansion of this network of voluntary certification schemes, as well as their endorsement by state actors. This option is explored because one frequently discussed strategic reason for the formation of such voluntary certification initiatives is the desire of the private sector to anticipate or pre-empt

binding regulation by states (Gulbrandsen 2004). Voluntary forest certification may also encourage agreement on shared norms, values and interests in an issue area where asymmetry of interests is strong not only within the sector (for example between small and large forest owners, producers and users), but also between different countries (for example developed and developing countries, boreal, temperate or tropical forest countries). While examples of states stepping in to regulate areas where the private sector has engaged in voluntary regulation are currently limited in the environmental sector, simply officially endorsing voluntary forest certification may be a feasible option to encourage an expansion of such voluntary forest certification schemes, and consequently the application of their criteria for sustainable forest management.

The following paragraphs will apply both the rules from the ModelGIGS framework on regime formation and regime implementation. Firstly, regime formation will be examined to identify the conditions under which conditions states would or would not agree to accept and endorse a voluntary certification standard. Secondly, regime implementation will be examined, as several global forest certification initiatives already exist, and the rules from the ModelGIGS framework may help in assessing their successes and shortcomings in implementation.

5.3 Applying the ModelGIGS Framework to Sustainable Forest Certification

5.3.1 Regime Formation

Problem structure

High **regulation costs** are identified in the ModelGIGS framework as an obstacle to regime formation. [21] Certainly, one advantage of this option would be that it is relatively cheap, as an instrument that has been developed and implemented by the private sector or public-private partnerships has practically no significant regulation or negotiation costs for states. However, as with some of the other options, the impact on economic activities remains significant despite low regulation costs, thus the economic value of wood products has been estimated at $400 billion per year, which means that "undertaking international obligations for sustainable forest management would have wide social and economic ramifications" (Dimitrov 2003: 141).

High **public concern** also encourages regime formation.[22] There is no comprehensive data on opinions across different continents regarding forest certification, however, a number of smaller studies provide at least some indications of public concern. For example, a small poll commissioned by Friends of the Earth Brazil indicated that 81% of the Brazilian population preferred certified forest products, even if these are slightly more expensive. Additionally, the poll suggested that respondents were aware of companies using certified wood, and specifically sought these out (Datafolha 2009). In Canada, a 2007 poll indicated that more than 90% of newspaper readers would like publishers to use paper from sustainable sources (Markets Initiative 2007). Furthermore, a recent Eurobarometer poll indicated that more than 80% of Europeans consider the environmental impact of a product 'rather' or 'very' important for their purchase decisions, while eco-labelling in general plays an important role in the purchasing decisions of nearly half of EU citizens (Gallup 2009).

[21] Rule A1.
[22] Rule A2.

Scientific uncertainty also decreases the likelihood of regime formation.[23] In the case of sustainable forest management, the scientific uncertainties that may affect regime formation are somewhat different from those affecting REDD+. Thus, while discussions on REDD+ still have to tackle substantial issues regarding for example indicators and monitoring, forest certification schemes have already conducted much work to adequately certify forestry companies (although regarding some issues, improvements can be made here as well, as will be discussed later on). However, scientific uncertainty in other areas will be a significant barrier to regime formation according to some authors, in particular the lacking knowledge about the transboundary impact of deforestation and sustainable forest management: while local effects are well understood, "they do not easily justify the need for state-to-state obligations" and coordinated action, where it is just as likely that "forest issues could be handled effectively through unilateral action" (Dimitrov 2003: 141).

Actors

Two issues that can decrease the likelihood of regime formation are great **asymmetry of interest** between **powerful states**, and **between important states within the issue area**.[24] In the case of forest certification, there are indications that such asymmetries do exist and need to be addressed before states could agree to support forest certification. Thus, not all regions are equally represented in certified forest area, and not all are equally keen on greater involvement. In particular, scholars studying forest certification schemes often highlight the North-South divide characterizing the application of many certification schemes (with most certified forest being in Europe and North America). One reason for this is that the criteria applied by many certification schemes are costly and may be difficult to implement for forest owners in less wealthy countries. Thus, e.g. tropical forests tend to be underrepresented in certified forest, so that "less than 2% of forest area in African, Asian and tropical American forests are certified", while globally approximately 8% of forests are certified (Zagt et al. 2010: v).

Such asymmetry of interest between powerful states and/or important states within the issue area has in the past also contributed to lacking **support** for a legally binding treaty,[25] primarily because "Northern countries wanted to conserve forests; southern or developing countries wanted (financial) support to do so", two perspectives that need to be reconciled adequately for an agreement (Visseren-Hamakers and Glasbergen 2007: 408).

However, **differentiation of rules** can, at least to some extent, address interest asymmetries and contribute to both an increased likelihood of regime formation, as well as regime implementation.[26] At least to a limited extent, current forest certification schemes allow for differentiation of rules. Thus, forest owners are able to choose between different certification standards. For example, FSC Germany and PEFC Germany have been found to have very different rules regarding issues such as pesticide use, choice of species for re-planting, and requirements for setting aside forest areas (Rametsteiner and Simula 2003). And, in some cases certification schemes specify only overarching, guiding standards, leaving the details to be hammered out by national committees to be sensitive to national differences (an example of such an umbrella standard is the PEFC). However, while such differentiation may be attractive for some reasons (e.g. to preserve the rights of access to a forest by indigenous

[23] Rule A5.
[24] Rules C3 and C4.
[25] Rules C5 and C6.
[26] Rules B2 and B3, Rules G2, G3 and G9.

groups) it may also undermine some of the benefits of forest certification. For example, the PEFC, which allows national committees to define the details of certification criteria, is also frequently criticized for enabling forest companies to choose standards that are less stringent than those promoted by the FSC (Gulbrandsen 2005b: 43, 46; Chan and Pattberg 2008).

Forest certification schemes also differ in terms of organizational structures (e.g. who is eligible to participate). PEFC for example allows more governmental influence, which in turn may lead governments to support it.

At the same time, there is also some degree of convergence among forest certification schemes, which may facilitate regime formation by indicating the agreement on common norms and standards. Thus, differentiation of rules can have rather ambiguous implications for forest certification. This observation is complicated by the fact that rule convergence among certification schemes is not necessarily driven by the identification of best practices, but happens because of market forces: it may be cheaper to implement some (less stringent) certification schemes, making them more attractive for forest companies seeking certification (Gulbrandsen 2006; 2008).

Regime environment

According to the ModelGIGS framework, the existence of a **preceding international agreement** dealing with the same or a similar problem enhances the likelihood of regime formation.[27] In the case of forest certification, the fact that numerous treaties, public and private initiatives, national, regional and international and organizations elaborating guidelines for sustainable forest management indicate that there is a lot of information to draw from, and a strong interest in improving forest management.

5.3.2 Regime Implementation

Regime design

Particularly in the case of collaboration problems such as unsustainable forest management, regime implementation is more likely if there is a **strong compliance mechanism.**[28] In the theoretical framework of the ModelGIGS project, a 'strong' compliance mechanism is defined as one that can impose sanctions on non-complying parties (Dellas et al. 2011).

Existing certification schemes do have procedures to check for compliance, indeed, it has been argued that voluntary forest certification schemes such as the FSC and PEFC are in some cases better at ensuring compliance than national authorities, suggesting that in "most tropical countries, forest legislation is poorly enforced outside certified forests" (van Bueren 2010: 11). However, while some certification schemes have rather stringent compliance checking procedures (for example the FSC can review the audits by the third-party auditors, Gulbrandsen 2008: 575). Forest certification schemes "lack the traditional enforcement capacities associated with the sovereign state" (Bernstein and Cashore 2004: 33, 23). Thus, while they can refuse to grant or revoke certification in case of non-compliance, forest certification schemes do not possess any sanction mechanisms and therefore lack a 'strong' compliance mechanism. Nonetheless, for the forestry companies that voluntarily subject themselves to the certification process, having their certification suspended as a sanction for non-compliance may be a substantial compliance mechanism, as the 'reward' of certification may improve their

[27] Rule D1.
[28] Rule G4.

reputation or allow them to charge a price premium for their products (Gulbrandsen 2006; 2008).

More **precise rules** are a further aspect that can contribute to increased likelihood of regime implementation.[29] In the case of forest certification in its current form, precision of rules refers to the clarity and measurability of the standards and indicators used by the certification schemes.

Many forest certification schemes are well developed, with clear criteria and indicators. However, these criteria are not necessarily concerned with biodiversity conservation, thus there may be a need to emphasize "clarity and consistency to ensure that biodiversity conservation requirements are not diluted" (Zagt et al. 2010: vii; van Bueren 2010)

Mechanisms for regular reporting and implementation review also increase the likelihood of regime implementation.[30] This is part of the regular procedures of many forest certification schemes, for example the FSC regularly checks whether a certified forestry continues to comply with its standards (Van Kuijk et al. 2010: 20).

Summary: implementation of sustainable forestry certification and opportunities for increased cooperation

- Overall feasibility (endorsement): **LOW to MODERATE**
    - Several factors support endorsement of forest certification, including low costs, high public concern for sustainable forest products and certification, as well as the many international agreements, conferences and programs encouraging cooperation and consensus-building.
    - However, asymmetry of interest between states is likely to be a substantial barrier, which has also limited support for more cooperation in this field in the past. Since key differences are related to the cost and access to certification, one recommended improvement is differentiating standards and methodologies for certification schemes that are particularly suited towards the different capacities and capabilities of forest owners. This is already applied by some fisheries certification schemes, as discussed in the following section. Side-payments, could also be a useful measure to encourage participation, access to certification and implementation.
- Overall feasibility (implementation): **MODERATE** to **HIGH**
    - One issue that may hamper implementation of sustainable forest management practices through certification schemes is the lack of strong compliance mechanisms. However, many certification schemes do have well developed systems for reporting and implementation review, so that non-compliant forest companies are likely to lose the benefits of certification.
    - The standards applied by forest certification schemes tend to be sufficiently precise, however their usefulness for biodiversity conservation could be improved in many cases.

[29] Rule G7.
[30] Rule G11.

6 Options for Reducing Global Biodiversity Loss: Sustainable Fishing

Option 7

"High Ambition (HA): stocks are restored to produce the maximum sustainable yield."

"High Ambition with Ramp down (HAR) is similar to the previous variant, but the reduction in effort takes place gradually of a ten year period"

"Moderate Ambition (MA) with the fishing effort reduced to an intermediate level between the current effort and maximum sustainable yield"

6.1 Existing Instruments to Reduce Marine Fishing Efforts

Overexploitation and depletion of marine fish stocks has substantial implications for marine biodiversity. It has therefore been suggested that a feasible way to address this issue is to reduce fishing efforts, and compensate for the reduction in fish catches by additional aquaculture (PBL 2010a). The study examines three possible variants as outlined in the text box above, which vary in their level of ambition (ibid).

Existing efforts at addressing overexploitation and depletion of marine fish stocks can be categorized as either certification of sustainable fishing, a total ban on fishing particular species, (tradable) fishing quotas, a cap on fishing efforts, or a combination of these variants. One example of voluntary certification of sustainable fishing practices is certification schemes such as the Marine Stewardship Council (MSC), which operate globally and certify the sustainable fishing practices of any wild-capture fishery. The MSC standard also includes a criterion regarding MSY, as principle 1 demands that "a fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery" (MSC 2010: 5). The number of public and private, international, regional and national fisheries certification schemes has been estimated at "400 and rising" (FAO 2008: 26), indicating the increasing popularity and proliferation of this marine fisheries certification as a strategy to combat overfishing, however, only four of them have both third-party certification and operate globally: the Marine Stewardship Council, Friend of the Sea, Naturland and the Marine Aquarium Council (Sainsbury 2010). All four of these are also private-sector initiatives, as most government-led certification schemes are regional or national in scope. Similarly to the case of forest certification, other international organizations and institutions, including the World Trade Organization and international standardization organizations such as ISO (International Organisation for Standardisation) and ISEAL (the International Social and Environmental Labelling and Accreditation) take an interest in the development of guidelines for fisheries and fisheries certification. For example, many evaluations of fisheries certification schemes and similar instruments in the fisheries sector evaluate their compatibility with WTO agreements and rules, as well as the appropriate ISEAL and ISO requirements (Accenture 2009).

Furthermore, at the national and sub-national level, multiple different quota regimes exist, such as the British Columbia Halibut Fishery Individual Vessel Quotas and Nova Scotia Multi-Species Individual Transferable Quotas.

Lastly, at the level of state cooperation, several examples of 'hard' and 'soft' law initiatives have developed since the 1982 United Nations Convention on the Law of the Sea (UNCLOS) (Sainsbury 2010: 5). In the first category, the 1995 United Nations Fish Stocks Agreement (UNFSA) establishes overarching management and conservation principles for migratory fish stocks, which was the basis for soft law agreements such as the FAO Code of Conduct for Responsible Fisheries, which is a voluntary code (Sainsbury 2010: 5). These agreements, together with international conferences such as the 2002 World Summit on Sustainable Development supported the development of regional fisheries management organizations. 18 regional fisheries management organizations now exist that apply a variety of different measures, including measuring impact on ecosystems, providing guidelines for fishing methods or conservation, research, moratoria, bans or quotas on fishing for specific species. Examples of these regional fisheries management organizations include the North Pacific Anadromous Fish Commission (NPAFC), which currently enforces a qualified ban on the fishing of various salmon species in the convention area; the International Commission for the Conservation of Atlantic Tunas (ICCAT), which has established maximum sustainable catch levels for a variety of tuna species; and the International Whaling Commission (IWC), which currently promotes a moratorium on whaling (although whaling for research or aboriginal use are excluded, and a return to whaling at maximum sustainable catch levels is in discussion).

Additionally, the Convention on Biological Diversity also addresses both Inland Water Biodiversity, and Marine and Coastal Biodiversity through two of its thematic programs. Its activities currently include promoting protected areas, integrated water management, conservation and sustainable use of biodiversity, minimizing negative effects of mariculture as well as the introduction of invasive alien species (CBD Secretariat 2006: 49; CBD COP Decision VII/5). Within the context of the CBD, some of the national biodiversity action plans and targets also include references to MSY, for example the current target of the European Community is to ensure that "Stock levels [are] maintained or restored to levels that can produce maximum sustainable yield, where possible no later than 2015" (UNEP/CBD/SP/PREP/3).

6.2 Selection of Instruments

Many fisheries organizations and instruments are far from the ambition of the recommendation to reduce fishing efforts to MSY levels (for example, some Regional Fisheries Management Organizations conduct research, provide loose guidelines or establish protected areas, but do not establish and monitor sustainable catch levels), others focus only on specific species, families or orders (such as tuna, salmon and whales), or on fisheries in specific regions (such as the Mediterranean, British Columbia, or North Pacific).

Considering this discrepancy with the option to reduce catch levels to maximum sustainable yield levels immediately or in the near future, this section will instead examine the possibility of endorsement of private sector schemes, such as the Marine Stewardship Council. Conversely, more flexible, private sector mechanisms may provide a forum where shared norms regarding these issues can be established among different actors within the sector. As Bernstein and Cashore (2007) have argued, as such certification schemes receive more widespread support, market signals and strategic benefits become stronger, and normative pressures on non-participants begin to increase. Endorsement could increase support for private sector certification schemes in multiple ways: firstly, by raising public awareness, more consumers may be compelled to look out for certified products (CBD Secretariat 2010: 62). Secondly, on a

related note, endorsing certified products also implies 'naming and shaming' of non-certified products, thus possibly encouraging more fisheries to seek certification. While marine fisheries certification in its current form may only be able to make a partial contribution to the restoration of fishing efforts to MSY levels, the rapid increase of certified fisheries indicates their potential impact. The MSC for example claims to certify more than 12% of fish captured globally for direct human consumption (MSC 2010).

Such endorsement of private-sector certification schemes can also be considered a distinct possibility in light of the work by the FAO to reach agreement on fisheries eco-labelling. The establishment of private-sector certification schemes such as the MSC prompted a discussion among FAO member states concerning an international state-led labelling scheme, however, since the member states were unable to reach agreement on such a labelling scheme FAO initiatives in this area are limited to non-binding guidelines for eco-labelling by marine capture fisheries (Sainsbury 2010; Gulbrandsen 2009). The FAO Fisheries and Aquaculture Department is currently working to refine these guidelines, but also considering "whether a single set of requirements could be developed that was adequate" (Sainsbury 2010: iv). This highlights the interest at enhanced cooperation in this field. Furthermore, a strong argument for cooperation on reducing overfishing beyond the national level is that "fish and fishery products are the most internationally traded food commodity" (FAO 2004: 95). Thus, unilateral requirements for fish products by individual states have in the past often limited market access for exporting states, especially poorer states where fisheries may not be able to comply with such requirements, or do not have the necessary data to prove their compliance (Gulbrandsen 2009; Sainsbury 2010). This demonstrates that the benefits of international cooperation on certification are based on far more than environmental concerns for over-exploitation (FAO 2008: 100).

The following section will apply both the rules from the ModelGIGS framework on regime formation and regime implementation. Firstly, regime formation will be examined to identify what may impede or support enhanced cooperation on marine fisheries certification at the global level, for example by refining the FAO guidelines for fisheries certification. Secondly, regime implementation will be examined, as several global marine fisheries certification initiatives already exist, and the rules from the ModelGIGS framework may help in assessing their successes and gaps in addressing overfishing.

6.3 Applying the ModelGIGS Framework to Sustainable Fisheries Certification

6.3.1 Regime Formation

Problem structure

High regulation costs are an impediment both to regime formation[31] and regime implementation[32]. Endorsement of certification schemes will imply relatively low regulation costs for governments, as the certification schemes discussed here are all private sector initiatives. Thus, the cost for verifying and monitoring adherence to the environmental and social standards is borne by the certification schemes and the fishing companies that wish to be certified. At the same time, the cost of applying for

[31] Rule A1.
[32] Rule E2.

certification and complying with the requirements of a standard may be one issue hindering a more widespread implementation of some standards, although there are incentives to apply for standard certification as well, such as the possibility to charge a price premium, or to use certification for promotional purposes.

Public concern for overexploitation of fish stocks seems to be relatively high, which is a further issue that may increase the likelihood of international cooperation.[33] One indication of public concern for overfishing is a recent Eurobarometer Survey on *Attitudes of Europeans towards the issue of Biodiversity*. The survey shows that among Europeans, 19% consider intensive farming, deforestation and overfishing as the most important threat to biodiversity (pollution of air/water and man-made disasters are considered most important by more citizens). Moreover, this factor has gained in importance in public perception in nearly all member states since 2007, indeed, in some countries it has more than doubled (Gallup 2010: 18-19). This indicates that awareness of the implications of overexploitation of fish stocks for biodiversity loss are increasingly well understood in these countries.

Furthermore, a recent Eurobarometer on *Europeans' attitudes towards the issue of sustainable consumption and production* indicated that more than 80% of Europeans consider the environmental impact of a product 'rather' or 'very' important for their purchase decisions, while eco-labelling in general plays an important role in the purchasing decisions of nearly half of EU citizens (Gallup 2009).

According to the ModelGIGS framework, **scientific uncertainty** is a factor decreasing the likelihood of regime formation.[34] Concerning measures to counter overexploitation of fish stocks, there has in the case of some fish and whale species been controversy regarding appropriate maximum sustainable yield levels. For example, disagreements regarding what represents adequate whaling levels have affected and continue to impact the IWC (Andresen 2002). Considering this scientific uncertainty, the advantages of a more flexible option such as voluntary fisheries certification is evident. Furthermore, there seems to be a "good international consensus on the general requirements of sustainable fisheries and there is considerable convergence in the operational interpretation of these requirements through good practice in international management, national management and various fishery eco-labelling schemes" (Sainsbury 2010: 27). This indicates that while scientific consensus may not be sufficient for establishment of binding MSY levels for many individual fish species, there is consensus on general sustainable fisheries requirements that can be implemented by eco-labels.

Negotiation process

With respect to agreement on international cooperation in fisheries certification, there is undeniably significant **asymmetry of interest** both between **powerful states** and **important states within the issue area**,[35] which can however at least partially be mitigated with **differentiation of rules** to make regime formation and implementation more likely.[36]

Key examples of asymmetry of interest between important states within the issue area are the different circumstances of small-scale fisheries and fisheries in developing countries on the one hand, and large fisheries and fisheries in developed countries on the other hand. Thus, for developing countries fisheries and small-scale fisheries

[33] Rule A2.
[34] Rule A5.
[35] Rules C3 and C4; Rules F8 and F9.
[36] Rules B2 and B3; Rules G2 and G3; Rule G9.

(which are also disproportionately in developing countries), the "cost of monitoring, assessment and management can be out of proportion to the value of the fishery and/or beyond the human and infrastructure capacity that is available", which may make the provision of the verifiable evidence that is necessary for third-party assessment and eco-labelling difficult (Sainsbury 2010: iv; Gulbrandsen 2009).

In such situations, there is a distinct possibility that labelled products are disproportionately found in large-scale fisheries and developed countries, which would make both an international agreement to cooperate on certification less likely, while also inherently limiting implementation of certification schemes to certain regions and fisheries. However, there have been considerable efforts among some certification schemes in the fishing sector to allow all fisheries that meet their sustainability criteria to be approved, even if they lack the capacity and conventional methods to demonstrate this. The MSC, for example, has developed methods that can also be applied by small-scale fisheries or fisheries where scientific data on stock conditions is lacking, as well as appropriate interpretations of its principles and standards (Sainsbury 2010: 18). Other certification schemes are also developing, testing and applying proxies and indicators that small-scale or "data-deficient" fisheries can use (ibid: iv).

At the same time, voluntary fisheries certification in its current form also contains a form of inadvertent differentiation of rules: applicants for certification can choose between different eco-labels which differ in the level of rigor, consistency of testing, and even the issues that are certified (for example, issues that are examined may include the ecological sustainability of fisheries and ecosystems, traceability of certified products through the supply chain, fair trade, workers' rights, and/or environmental impact assessments such as carbon footprint (Accenture 2009)). Thus, not only are products certified by different eco-labels not necessarily comparable, but fisheries seeking the benefits of labelling may also be able to choose between different certification schemes that focus on criteria that are easiest for them to fulfil. This type of differentiation of rules is thus not necessarily desirable, however, efforts to address this situation do exist, e.g. through the guidelines for marine capture fisheries eco-labelling developed and refined by the FAO Fisheries and Aquaculture Department since 2005 (Sainsbury 2010: iv). At the same time, many of the problems associated with certification schemes that are deemed less suitable (such as rules that are not stringent enough, imprecise criteria etc) stem from the fact that they are not well developed yet, while the certification schemes that have existed for a longer period (such as the MSC and Friends of the Sea) are often evaluated more favourably (Accenture 2009). This indicates that many of the concerns discussed in following paragraphs (and often primarily associated with the younger labels) may be addressed as they become more established.

A further facet of asymmetry of interest between important states within this issue area is that not all states have an equal stake in the trade or consumption of certain species of fish, and those states that do not trade or consume a particular species of fish may be more likely to support restrictions in this area. The possibility that states may differ in their support for certification schemes depending on their stake in the affected fisheries is indicated by the case of the International Whaling Commission (IWC). Thus, during its first thirty years of existence, only about 15 states with a commercial interest in whaling were members to the IWC. However, there were no rules limiting membership, allowing multiple non-whaling states and even land-locked states such as Switzerland to join the IWC in the late 1970s. With the new increased membership of around 40 states, it was easy to meet the required majority for implementing a moratorium on all commercial whaling (Andresen 2002: 397).

Side-payments are a further characteristic that encourages regime formation, particularly for collaboration problems.[37] Overfishing is a typical collaboration problem, as those fishing companies that choose to continue overfishing enjoy a significant increase in catches in the short-term, while the long-term cost of overfishing affects all fish companies relying on the same stock equally. Voluntary certification schemes in their current form are not able to address this collaboration problem sufficiently, as fish stocks in one area may be used by different fishing companies, from different countries. Thus, certifying one company only in an area would have little effect, and is indeed often not possible as adherence to fishing quotas cannot be guaranteed if others also have access to the same fish stocks (Gulbrandsen 2009: 658). Thus, side-payments could be used to increase the possibility of regime formation despite overfishing. While voluntary certification is currently not associated with any systematic provision of side-payments, the FAO report supports the provision of "funding to support eco-label certification in developing States", where fisheries may face more significant financial obstacles to meeting the sustainability criteria of certification schemes, and moreover in demonstrating their adherence to those criteria (Sainsbury 2010: 28). Such side-payments thus not only may make it more likely that states endorse and encourage certification, moreover they may also aid with their implementation.[38] However, it has been emphasized that financial support for fisheries to implement sustainability criteria should not come from the certification schemes themselves, as this compromises their independence (Accenture 2009: 113).

Actors

The level of **support** by **powerful states** and **important states within the issue area** for international cooperation on fisheries certification has widely differed, which may have implications both for the possibility of official endorsement[39] of voluntary fisheries certification, as well as the effective implementation[40] of existing certification schemes. For example, in the early days of the MSC, several European governments voiced criticism of such private certification schemes, arguing that they are "an attempt to create a private transnational management regime beyond national jurisdiction", which furthermore marginalizes governments by treating them like all other stakeholders (Gulbrandsen 2009: 656-7).

Furthermore, the possible difficulties for developing country fisheries in complying with certification criteria outlined earlier have in the past also led to objections by them to a more concerted effort at cooperation in this field (Gulbrandsen 2009). If such issues are not addressed, then **participation** by developing country fisheries in certification schemes is also likely to remain limited, which thus reduces implementation.[41] This problem is widely noted with respect to the current status of fisheries certification: it may be limited to producers who have low compliance costs in the first place, to fisheries which have the necessary financial means, technical equipment and data to demonstrate compliance (Gulbrandsen 2009).

[37] Rule B4.
[38] Rule G5.
[39] Rules C5 and C6.
[40] Rules F5 and F6.
[41] Rule F3.

Regime environment

A **preceding international agreement** dealing with similar issues is also considered to enhance the likelihood of regime formation.[42] In the case of marine fisheries certification and labelling, the discussions between states on this issue in the context of the FAO may provide both a conductive environment and a suitable foundation for enhanced cooperation in this field.

6.3.2 Regime Implementation

Regime design

A **strong compliance mechanism** is a further component of successful regime implementation, particularly in the case of collaboration problems.[43] In the ModelGIGS project, a 'strong' compliance mechanism was identified as one with the capacity to impose sanctions (Dellas et al. 2011). In the case of voluntary fisheries certification, compliance works somewhat differently than in the context of formal, legally binding international agreements. Thus, compliance with the criteria of a standard is assessed by a second (or, ideally) a third-party actor. Furthermore, in the case of the MSC for example fisheries are also regularly re-assessed and monitored, to ensure ongoing compliance with sustainable fishing criteria (Sainsbury 2010: 18).[44] However, in many cases the strength of compliance assessments is reduced by the fact that the sustainability assessments of many certification schemes rely on imprecise criteria (Accenture 2009). Furthermore, in difference to forest certification, where non-compliance with many certification criteria is more easily established, in the case of fisheries proof of (non-)compliance is complicated by the fact that many fish are migratory (Gulbrandsen 2009). Moreover, a substantial weakness regarding compliance with fisheries certification is the general lack of sanctions and corrective measures (FAO 2008: 100).

Precise rules are a further factor that contributes to increased likelihood of regime implementation.[45] However, inaccuracy and lacking precision of rules is often criticized about many of the currently active marine fisheries certification schemes (Accenture 2009). In some cases, this makes measurement and verification of the criteria open to interpretation, and may encourage "arbitrary ecolabelling decisions" (Sainsbury 2010: 1). Clearly, a problem that certification schemes need to address in the future is to develop rules that are both precise and flexible enough to be applied to both small and large-scale, developed and developing country fisheries. However, at the same time it is worth reiterating that the certification schemes that are most criticized for a lack of precise criteria tend to be of recent origin.

Regime environment

One issue that may hinder implementation is **negative interplay** with other regimes.[46] In the case of fisheries certification, the potential negative interactions with the WTO have received significant attention, as the certification standards may be discriminatory (e.g. if the high cost of demonstrating compliance with them prohibits smaller fisheries or fisheries from poorer countries to apply), and thus may also create

[42] Rule D1.
[43] Rule G4.
[44] **Mechanisms for regular reporting and implementation review** are also considered to contribute to increased likelihood of implementation, independently of compliance procedures (Rule G11).
[45] Rule G7.
[46] Rule H2.

obstacles to trade (FAO 2008; 2010b; Accenture 2009). Furthermore, it has been argued that the standards of private certification organizations may reproduce similar rules already required by the authorities in the exporting or importing countries (FAO 2008: 96). Nonetheless, as the discussion on differentiation of rules earlier on in this chapter has indicated, there have been substantial efforts to ensure that certification standards are not discriminatory to products from particular countries or producers.

To summarize, there are numerous barriers and opportunities both for implementation of the current system of marine fisheries certification schemes, as well as expanded cooperation internationally to increase support for these schemes. Concerning implementation of existing certification schemes, some of the shortcomings are that while they do have mechanisms for checking compliance, they cannot enforce sanctions; in some cases, rules are insufficiently precise to allow adequate testing of compliance; and possible negative interplay with other regimes. However, concerning agreement on expanded international cooperation in this field, there are a number of opportunities. Firstly, it is very cost-efficient for states, as the most significant cost falls on the fisheries that are applying for certification. Secondly, public concern (at least in European states) for both eco-labelling and overfishing seems high. Thirdly, while there is still some scientific uncertainty, this has diminished in recent years. The most substantial barrier to more cooperation in this field is the significant asymmetry in interest between powerful states and/or important states within the issue area, which has in the past already blocked discussions on a government-led global certification scheme and reduced support for such an agreement by a number of states. To some extent, these asymmetries (most notably between developing countries with predominantly small-scale fisheries on the one hand, and developed countries with large-scale fisheries on the other hand) can be addressed by differentiation of rules. A further development that could encourage more cooperation in this area is the implementation of side-payments: while these do not exist under the current certification system, FAO strongly encourages them. Thus, as this summary indicates, while there are considerable barriers to enhanced cooperation in this field, they can be overcome.

Summary: implementation of sustainable fisheries certification and opportunities for increased cooperation

- Overall feasibility (endorsement): **LOW** to **MODERATE**
    - Several factors support endorsement of marine certification, including low costs, high public concern regarding the problem of over-fishing as well as interest in eco-labeling, as well as increasing scientific certainty and consensus.
    - The most impeding factor is likely to be asymmetry of interest (primarily between countries where fisheries tend to lack financial capacities, tend to be small-scale and/or data-deficient and countries where fisheries tend to be large, have sufficient funds and statistical data on stock conditions available), which has obstructed government-led action in the area before. These issues can (and to some extent already are) be at least partially addressed by differentiation of rules. Furthermore, the FAO suggestion of financial or technical support for small, data-deficient fisheries and similar side-payments may be promising as well.
- Overall feasibility (implementation): **MODERATE** to **HIGH**
    - Several factors may limit the implementation of existing certification schemes. Thus, as with the forest certification schemes discussed in the previous section, the lack of strong compliance mechanisms may limit implementation.
    - Compared to forest certification, rules are also often less precise and may thus limit implementation, in particular because lacking precision of rules and methodologies also complicates review and reporting.
    - Possible negative interplay with other regimes should also be avoided

7 Options for Reducing Global Biodiversity Loss: Closing the Yield Gap and Reducing Post-Harvest Losses

Option 3

"Improved agricultural practices are assumed to result in 40% additional growth in crop productivity by 2050 and 20% additional growth in livestock productivity"

Option 4

"A gradual reduction in post-harvest losses in food supply chains worldwide by 15% of total food supplies"

7.1 Existing Instruments to Increase Agricultural Productivity and reduce Post-Harvest Losses

Two further strategies to reduce biodiversity loss are increasing agricultural productivity and reducing post-harvest losses in the food chain. Increasing agricultural productivity would mean that rising global food demands could be met with less expansion of agricultural lands into natural areas, while reducing losses and waste in the food chain would imply that agricultural production requires less space and therefore potentially leave more areas for biodiversity to flourish (PBL 2010a).[47] Therefore, the study also examines the implications of the two options outlined above.

However, currently we have no instruments targeted specifically at stimulating agricultural productivity through increased agricultural knowledge, sustainability and technology (AKST). Similarly, reducing losses and wastes in the food chain is not a topic that is currently explicitly addressed by any international organization, partnership, or other instrument.

Firstly, regarding agricultural productivity, assessing the influence of investments in AKST is difficult for policymakers to gauge (Rosegrant et al. 2009), and thus cooperation is mostly limited to research activities. One example of a large research initiative in this area was the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), composed of one global assessment and five sub-assessments. Among other things, this initiative calls for increased investment in AKST as essential for higher agricultural yields. Another example of international research cooperation in this area is the strategic multi-sector partnership of the Consultative Group on International Agricultural Research (CGIAR). One of the objectives of the CGIAR (2010) is to "create and accelerate sustainable increases in the productivity and production of healthy food by and for the poor", which translates into research and innovations on a number of AKST-related issues. For example, the CGIAR has developed flood tolerant rice varieties for regions prone to flood-related harvest losses, such as Bangladesh, as well as crossing high-yield rice varieties with more pest-resistant ones to increase productivity. Such AKST strategies include conventional approaches such as plant breeding based on seed selection and

[47] Even though a reduction in food supply chain losses leads to lower food prices and, correspondingly, increased consumption, the reduction in required agricultural land is so extensive that this strategy would still have biodiversity benefits (PBL 2010).

crossbreeding, which can be aided by modern gene banks, gene mapping, and genetic engineering. One of the mechanisms for implementation of CGIAR activities are partnerships for sustainable development. Including the CGIAR partnerships, there are currently a total of 103 partnerships registered with the UN Commission on Sustainable Development (CSD) that consider agriculture one of their primary or secondary themes, among which some specifically address agricultural productivity or the reduction of post-harvest losses.

The CBD program of work on Agricultural Biodiversity (decision V/5, annex) also includes the aim to "identify management practices and technologies that promote the positive and mitigate the negative impacts of agriculture on biodiversity" (CBD Secretariat 2006: 48). In the private sector, the identification of best practices for agriculture is also promoted by NGOs, private sector companies, and certification schemes for agricultural products (ibid: 66). Such guidelines and certification schemes could be a way of developing criteria related to AKST and agricultural productivity, such as efficient nutrient use and irrigation efficiency.

One strategy that can be identified as suitable to implementing a high-AKST option and increasing agricultural productivity is investment, aid, and technology transfer to developing countries. Focusing on developing countries would be particularly important not only because food security is a more prominent issue, but also because the potential for increases in agricultural productivity remains far higher in these regions, whereas only limited productivity gains can be expected in developed countries (PBL 2010a). The importance of such investment is highlighted by the Food and Agriculture Organization of the United Nations (FAO), which specifically highlights the importance of increasing agricultural productivity in developing countries, where growth in agricultural productivity currently lags behind population growth (OECD/FAO 2010). Recent FAO activities in the field of agricultural productivity include a World Seed Conference in 2009 (organized together with the OECD Seed Scheme and several other associations working on related issues), where the opportunities of new crop varieties for agricultural productivity were examined (OECD/FAO 2010: 114).

Regarding the reduction of post-harvest losses, the FAO has also launched several initiatives, starting with the 1974 World Food Conference and *Special Action Programme for the Prevention of Food Losses*, launched in 1977, which included training programs on issues such as improved storage and handling (FAO 1989). More recent initiatives working in this area include the FAO *Strategy for a Food Chain Approach to Food Safety and Quality* (FAO 2003: 11). FAO initiatives on waste reduction and reducing food losses focus on issues such as improved storage facilities and technical training; training regarding adequate storage, transportation and packaging; improved technology, and cooperation between governments and the private sector in this field (FAO 2010a). The FAO initiatives in this field have, for example, channelled funding from donor countries towards several projects in countries such as Kenya, Afghanistan and Guinea, where the funding was used to create storage facilities that were safe from chemical contamination, pest infestations and similar incidents (FAO 2010b).

7.2 Selection of Instruments

As the outline above indicates, international cooperation on both agricultural productivity and reducing post-harvest losses is limited to 'soft' options such as voluntary guidelines, uncoordinated investment, and research. As will be demonstrated below, the ModelGIGS framework provides some indications regarding why this might

be the case, and what the barriers to a binding agreement are. However, it is also possible to speculate on the possibilities for enhancing the existing activities outlined above so that they at least partially contribute to meeting the goals stated in options 3 and 4.

The FAO has some activities in both the area of increased agricultural productivity and post-harvest losses. Thus, the possibilities for expanding FAO work in both areas will be examined in the following paragraphs. FAO was identified as a more suitable instrument for this than any other option for two key reasons: firstly, far more governments are members of FAO, meaning that work by FAO in this area will be disseminated more widely. Secondly, as an international organization, FAO is more established and has more resources available. However, it is necessary to clarify what sort of FAO activities in this area are considered here. Thus, this is a 'soft' approach, focusing on the coordination of aid and investments, organizing workshops and training programs, and facilitating research. A binding mechanism is not assumed.

As the following section will focus on the possibility of expanding cooperation in agricultural productivity and reducing post-harvest losses, rather than examining the implementation of existing measures, the ModelGIGS rules on regime formation will be applied to identify what potential there is for increased international cooperation in this area.

7.3 Applying the ModelGIGS Framework to the Food and Agricultural Organization

Problem structure

An issue that would have to be addressed by any attempt at increased cooperation on agricultural productivity or reducing post-harvest losses are the potentially high **regulation costs**, which would undermine possibilities for regime formation.[48] While policy recommendations and exchange of knowledge among FAO members will probably not necessitate significant added costs, encouraging increased research and investment in new technologies may be costly. For example, spending by the public and private sectors on agricultural research and development in 2000 amounted to roughly 13 and 23 billion USD respectively (IAASTD 2010: 13), a number that would have to increase further in order to achieve the 40% increases in agricultural productivity and reduce post-harvest losses. One way to reduce the cost burden could be to stimulate private sector investment in this area, which seems feasible due to the strong economic incentives for both increasing productivity and reducing post-harvest losses. At the national level, some governments have already been promoting increased private sector investments in this area. However, this often comes as a consequence of cuts in foreign aid budgets. The Dutch Ministry of Foreign Affairs, for example, recently announced that it will cut Official Development Assistance by €400 million from 2010 to 2011, instead trying to encourage investment and business opportunities (MFA 2010a). One way the ministry is doing this is by encouraging public-private partnerships working on several of its priority issues, including agriculture (MFA 2010b). However, individual national level initiatives or partnerships are unlikely to have a significant impact on global agricultural productivity and reducing post-harvest losses, a framework for encouraging and coordinating this at the international level could have a more substantial impact in this area.

[48] Rule A1.

High **public concern** for a problem contributes to an increased likelihood of regime formation.[49] While there are no available surveys on opinions on agricultural productivity or reducing post-harvest losses, some surveys address particular aspects of these issues. For example, one recent Eurobarometer asked respondents on their opinion regarding biotechnology and genetic engineering. A mere 53% felt that this would improve their way of life in the next 20 years (TNS Opinion 2010a). 84% are aware of GM food specifically, however, more than half feel that it is harmful for the environment, a majority believes it harms human health, 70% consider it to be "fundamentally unnatural", and only 43% feel that GM food is useful for developing countries (TNS Opinion 2010a: 18). These results indicate that at least in many European countries, concerns for consumer safety and environmental protection lead to significant scepticism regarding some AKST practices. Nonetheless, it is worthwhile noting that AKST is a broad field, and furthermore does not aim at productivity increases at any cost, but also "to optimize it across a far more complex landscape of production, rural development, environmental and social justice outcomes" (Pretty et al. 2010: 221).

Furthermore, while the European public seems to be sceptical about some AKST practices, both increasing agricultural productivity and reducing post-harvest losses are linked to development, which is an issue where public concern is high. Thus, a recent Eurobarometer on the Millennium Development Goals highlights that 89% of respondents attach a high importance to development (TNS Opinion 2010b). In particular, poverty and food are perceived as two of the three most important challenges facing developing countries (TNS Opinion 2010b), both of which can at least partially be addressed by increasing agricultural productivity and reducing post-harvest losses. Possibly, by highlighting such cross-cutting issues, public interest for issues such as agricultural productivity can be increased.

One reason why we cannot expect cooperation in the fields of agricultural productivity and reduced post-harvest losses to go beyond policy recommendations, guidelines, and limited investment in the near future is **scientific uncertainty** on these issues,[50] which decreases the likelihood of regime formation. Thus, while there is some consensus on the importance of reducing post-harvest losses and in particular increasing agricultural productivity for reducing biodiversity loss, but also addressing other issues ranging from food prices and availability, to climate change. However, the complexity of these issues and the scientific uncertainty regarding how to achieve these goals frustrates targeted action in this area (OECD/FAO 2006: 28; Pretty et al. 2010; Rosegrant et al. 2009). For example, we know that technology can lead to improvements in agricultural productivity, but different technologies have varying implications (and possible side-effects that need to be researched), and calculations of the actual productivity increases from implementing new technologies are difficult to establish.

On the issue of reducing post-harvest losses, research and development has also made significant progress in recent decades, for example regarding integrated pest management (IPM), however, in this field again research on the "application of IPM methods is lagging" behind to control crop and post-harvest losses (Pretty et al. 2010: 227-8).

[49] Rule A2.
[50] Rule A5.

Negotiation process and actors

Asymmetry of interests between **powerful states** or **important states within the issue area** decreases the likelihood of regime formation;[51] however, such effects can to some extent be ameliorated by acknowledging asymmetries through **differentiation of rules**.[52] In the case of agricultural productivity and efforts to reduce post-harvest losses, asymmetries are possible. On the one hand, technology transfer often implies concerns regarding intellectual property, a factor that has already in the past had both constraining and stimulating implications for "public, private and philanthropic investment in crop genetic improvement" (Pretty et al. 2010: 227). On the other hand, as mentioned earlier different regions have different potentials for growth regarding both issues, but the funding available towards implementing policies and technologies encouraging increased agricultural productivity or reducing post-harvest losses does not always match this potential. Thus, it would be useful to implement a mechanism encouraging financial support and technology transfer from developed to developing countries. In this sense, the possibility of **side-payments** would also be introduced into the negotiation process, which is a further factor increasing the likelihood of regime formation.[53] However, as there are currently no ongoing negotiations in this area to agree on an encompassing treaty regarding agricultural productivity or reducing post-harvest losses, it is not possible evaluate the implications of **side-payments** or **differentiation of rules** on the negotiation outcome and likelihood of regime formation.[54] Furthermore, the fact that there are no ongoing negotiations in either area can also be interpreted as a factor reducing the likelihood of regime formation, as it indicates that this issue is currently rather low on the international agenda.

As the analysis above indicates, applying the rules of the ModelGIGS framework (Dellas et al. 2011) suggests issues that are more or less supportive of increased international cooperation on agricultural productivity and reducing post-harvest losses. Thus, one opportunity regarding the possibility of increasing cooperation in these areas under the FAO are the relatively low direct regulation costs involved for states, as no legally binding rules are established. However, meeting the goals stated in the options would require significant investments in research and technology transfer. Additionally, several barriers are also likely. For example, public concern (at least among Europeans) seems to indicate weariness regarding some AKST measures, in particular genetic engineering.

[51] Rules C3 and C4.
[52] Rules B2 and B3.
[53] Rule B4.
[54] Rules B2, B3 and B4.

Summary: agreement on increased cooperation on agricultural productivity and reducing post-harvest losses through the FAO

- Overall feasibility: **LOW**
- While the FAO has some expertise and existing cooperation on both issues, agricultural productivity and reducing post-harvest losses are issues that are generally be addressed at the level of the state
- However, increased international cooperation on these issues would be beneficial, due to the asymmetries between states. Thus, most improvements in both areas, and in particular agricultural productivity, can be achieved in developing countries. Side-payments in the form of technology transfer and financial assistance could be beneficial here.
- Another factor supporting cooperation in this area include the low immediate cost, while public skepticism toward some innovative agricultural practices that increase productivity could be a barrier towards innovations in this area.

8 Options for Reducing Global Biodiversity Loss: Changing Diets

Option 5

"A shift is assumed to a healthier diet [...] based on daily consumption of beef, pork and poultry/eggs of 10, 10 and 44g per person, respectively"

"No-meat diet assumes complete substitution of meat with plant-based proteins" (sensitivity variant)

8.1 Existing Policies Encouraging Dietary Change

Dietary change is another option that may have positive implications for biodiversity. In particular, reducing or eliminating meat consumption can reduce pressure for expansion of agricultural lands. Therefore, an option that was considered by PBL (2010a) is the implications of introducing a no-meat diet, or a low-meat diet.

While there are no international agreements promoting dietary change, studies suggest that several policy options could contribute towards reducing meat consumption. However, these vary not only in their potential to contribute to the projections in the scenarios, but also in terms of feasibility. Thus, the only option that would lead to a measurable and immediate response to the target is a complete ban on meat, which is also the least realistic option. Another possibility with significant implications is removing subsidies for livestock production (leading to both a decrease in production of livestock and an increase in price of animal products), or even increasing the price of animal products (for example via a tax). However, widespread agreement on such policies is also unlikely. More workable, 'soft' options include educational campaigns addressing the health advantages of eating less meat and the environmental consequences of meat production, as well as making plant alternatives to meat protein more attractive and culturally acceptable to consumers. However, to what extent this will promote consumers to switch to a Willet or no-meat diet is difficult to estimate.

A number of existing international institutions could take on the role of supporting international cooperation in this area and promoting some of the policies outlined above, such as educational campaigns. One existing framework is the Marrakech Process, led by the UN, which coordinates the development of programs for sustainable consumption and production that were called for at the 2002 Johannesburg World Summit on Sustainable Development (OECD 2008). In particular, the task forces on 'sustainable lifestyles' and 'sustainable products' could be suitable forums for promoting dietary change. A further possibility is the World Health Organization (WHO), which could focus on the health-related aspects of dietary change. While the current WHO Global Strategy on Diet, Physical Activity and Health avoids any mention of meat products, or healthy/sustainable meat and dairy consumption, it does specifically encourage policies recommending consumers to "increase consumption of fruits and vegetables, and legumes, whole grains and nuts" (WHO 2004: 4). However, other smaller documents, such as the WHO Fact Sheet on Cancer, recommend that red meat consumption should be limited, indicating discussion of low-meat diets in the WHO. Overall, the WHO Global Strategy has been evaluated as a significant step in WHO strategies on diet and health, as earlier "WHO strategies have concentrated on diseases related to deficiencies of food and of energy,

protein and specific nutrients, and on infectious diseases to which vulnerability is often modified by nutritional status", while the new strategy represents a shift in the direction of control and prevention of chronic disease, particularly by addressing dietary risk factors such as high blood cholesterol, high fat, sugar and/or salt (Cannon 2004). As a WHO/FAO expert report on Diet, Nutrition and the Prevention of Chronic Diseases, which in many ways influenced the negotiations on drafts of the WHO Global Strategy explicitly addresses the role of meat and dairy consumption for many dietary risk factors and chronic diseases, it seems possible that future adaptations of the Global Strategy also include recommendations on healthy levels of meat and dairy consumption.

8.2 Selection of Instruments

Considering that international cooperation on dietary guidelines is currently rather limited, a realistic approach towards encouraging less meat and dairy intensive diets would be guidelines or an awareness/education campaign by an international organization such as FAO and WHO. The mandates of both of these organizations indicate that it would be possible to expand their current work to address consumption of animal products (such as meat, dairy and eggs). However, it seems that current WHO policies are already somewhat more in the direction of the target specified in the scenario. Thus, while much of the FAO work on diets addresses basic problems such as ensuring adequate nutrition and food safety, the WHO strategies on diet include issues such as refined and processed food, vegetable and fruit consumption. A discussion on reduced consumption of animal products seems more feasible within this context. Of course, the impact of the current and any future versions of the WHO Strategy is rather limited compared to other options such as taxation, and hard to measure. However, even though agreeing on such a modest WHO Strategy adaptation may be difficult, it is still far more realistic at this point than many other options, such as taxation. Furthermore, even though individual government action encouraging healthy diets is also possible, its impact will remain limited unless citizens of other states can be encouraged to consume less animal products as well. Therefore, coordination of dietary guidelines at the international level would be desirable even if individual governments or businesses promote much more far-reaching measures with a more direct potential for behavioural change.

As the current WHO *Global Strategy* omits any reference to healthy and sustainable consumption of animal products, the following sub-section will apply the rules from the ModelGIGS framework on regime formation to identify what chances and hindrances there are to expanding WHO dietary guidelines to include a more explicit reference to meat, dairy and/or egg consumption. The current WHO *Global Strategy* provides broad guidelines on aspects of diet and exercise relating to health, as well as guidelines on implementation for member states, private companies and civil society actors. For example, the suggestions to governments include: communication and public awareness strategies; marketing and promotion; appropriate labelling; regulation of health claims made by producers; using fiscal policies to influence both production and consumption; food programs that encourage healthy eating as well as "local production and sustainability"; and agricultural and school policies that are appropriate to the guidelines of the strategy (WHO 2004: 8). The recommendations for private sector activities include providing more healthy options; changing the formulations of existing (processed) foods, for example to reduce fat or salt content; providing adequate information and labelling on food products (WHO 2004). Furthermore, the strategy recognizes the need for international cooperation on many

aspects of implementation, for example because many companies operate internationally (WHO 2004: 13).

8.3 Applying the ModelGIGS Framework to the WHO Global Strategy

Problem structure

As has been discussed in earlier sections, higher **regulation costs** make regime formation less likely.[55] However, the option discussed here is likely to be among the least costly in terms of implementation, as it would involve an adaptation of existing dietary guidelines of the WHO. Furthermore, the current WHO *Global Strategy on Diet, Physical Activity and Health* gives the WHO the responsibility to define general implementation guidelines, while leaving the definition of suitable measures for implementation to member states, the private sector and civil society. For example, private sector companies promoted the WHO *Global Strategy* by being responsible employers and "advocates for healthy lifestyles", and improving food and beverage products to fit the recommendations in the strategy (WHO 2010).

Higher **public concern** for an issue is also more likely to lead to international cooperation in an area.[56] In the case of the environmental and/or health benefits of a diet low in meat and other animal products, a Eurobarometer survey on health and food suggests that while a majority of Europeans consider fruit and vegetables (58%) important components of a healthy diet, only 16% consider eating less meat an important part of a healthy diet (TNS Opinion 2006: 19).[57] Similarly, of those citizens that recently implemented dietary changes, these changes involved eating more fruit and vegetables for 55%, while only 20% consciously reduced their meat intake (TNS Opinion 2006: 37). This indicates that, at least among Europeans, a link between reduced meat intake and healthier diets is not straightforward. Conversely, it also suggests that a strategy aimed at changing such perceptions does have significant potential to change food consumption attitudes. Furthermore, a recent Eurobarometer on sustainable consumption indicated that the environmental impact of the products they buy is rather important or very important to 83% of Europeans (Gallup 2009), indicating that emphasizing the link between ones dietary choices and their environmental impact may also be a suitable strategy.

According to the ModelGIGS framework, **scientific uncertainty** is a factor that decreases the likelihood of regime formation.[58] While public concern for implications of meat consumption for healthy diets seems to be low among Europeans, information provided by large, (intergovernmental) organizations working on issues related to livestock, health, diets and the environment indicate some consensus on the implications of meat production and consumption on the environment, and at least some health-related impacts (OECD/FAO 2006; IAASTD 2009; WHO/FAO 2003). For example, the IAASTD points out that "unbalanced diets are often related to low intake of fruits and vegetables and high intake of fats, meat, sugar and salt" (IAASTD 2009: 15), while FAO (2006: xxiii) argues that "the livestock sector may well be the leading player in the reduction of biodiversity, since it is the major driver of deforestation, as well as one of the leading drivers of land degradation, pollution, climate change,

[55] Rule A1.
[56] Rule A2.
[57] Questions about animal products in general or specifically about dairy and eggs were not included in the survey.
[58] Rule A5.

overfishing, sedimentation of coastal areas and facilitation of invasions by alien species".

Negotiation process

As there are no ongoing negotiations in this area, we cannot discuss the implications of rules regarding the influence of **side-payments** or **differentiation of rules** on the negotiation outcome and likelihood of regime formation.[59] However, the fact that there are no ongoing negotiations on dietary change can in itself be considered a factor reducing the likelihood of regime formation, as it indicates that this issue is currently rather low on the international agenda.

Actors

With respect to dietary recommendations, **asymmetry of interest** is significant both among **powerful states** and **important states within the issue area**, two issues that are linked with decreased likelihood of regime formation.[60] This asymmetry is most evident in the changes and dilutions that occurred throughout various drafts of the current *WHO Global Strategy on Diet, Physical Activity and Health*, in particular with respect to references to consumption of certain products, such as sugar, dairy and meat.

Early drafts of the WHO strategy referred strongly to the WHO/FAO expert report on *Diet, Nutrition and the Prevention of Chronic Diseases*. This report takes a strong and explicit stance on consumption of some animal products, and specific meat products in particular. It recognizes the importance of such high-value protein in enhancing the diets of many people, particularly in the developing world (WHO/FAO 2003: 21). However, it also underpins that excessive consumption of some animal products is linked to high intakes of saturated fats and cholesterol, as well as colorectal, pancreatic and stomach cancer, and consequently recommends a controlled or restricted intake (WHO/FAO 2003: 21, 96-98).

However, these and other dietary recommendations were significantly modified and diluted by the final draft of the WHO *Global Strategy*. With respect to many of the changes, in particular recommended upper levels of sugar intake, the objections by some actors (the US government and the sugar industry in particular) are well documented. Objections by the US government to the WHO/FAO report include a lack of scientific evidence, recommendations on legal or fiscal policies are beyond the WHO mandate and violate the US constitution, and that the recommendations in the WHO/FAO report may have been deemed to have negative implications for US economic and trade interests (Cannon 2004: 375).

While these objections have been highlighted in particular with respect to guidelines on sugar intake, it seems likely that references to limiting consumption of meat and other animal products may also have been removed due to influence countries and industries with particular economic interests in this area. This is also indicated by the consultation summaries and comments supplied by some individual countries, organizations and companies. For example, at an industry consultation on a draft of the WHO *Global Strategy*, the President of the International Federation of Agricultural Producers (IFAP) commented that the "WHO is wrong to put forward the idea of 'good foods' versus 'bad foods', with fruits and vegetables being 'good' and meat, dairy and sugar products being 'bad'" (IFAP 2003: 30), highlighting that industry representatives

[59] Rules B2, B3 and B4.
[60] Rules C3 and C4.

were also trying to lobby for the deletion of any explicit negative references to meat and dairy products. Other countries, such as Brazil also commented that the "economic and commercial impacts of the proposed Global Strategy are not sufficiently assessed yet" (Permanent Mission of Brazil 2004: 1), showing how countries felt that guidelines recommending restricted consumption of certain products was feared to have negative impacts on their agricultural sectors.

Nonetheless, **support** by **powerful states and important states within the issue area**[61] for the final document was high, as it was approved by the WHO's World Health Assembly (WHA). The WHA contains representatives from all 193 member-states of the WHO.

The **homogeneity of states** that are needed to regulate a harmful activity is a further variable that affects the likelihood of regime formation.[62] In the case of the current WHO *Global Strategy*, the lack of homogeneity among states may be one factor limiting a more far-reaching strategy containing a discussion on consumption of animal products, such as the one that was in the WHO/FAO report. Thus, a number of states took the position that dietary recommendations should not be global due to cultural differences (e.g. the US government – for a discussion, see Cannon 2004). Because of this, additions and comments on the draft strategy suggested by some governments also highlight that diet is an individual responsibility where guidelines at the global level are inappropriate, e.g. by inserting references to the importance of "personal choice, social norms, economic and environmental factors" in diets (Department of Health and Human Services 2004: 6).

To summarize, applying the rules of the ModelGIGS framework (Dellas et al. 2011) suggests several opportunities and barriers to international agreement on a global strategy for diet and health that explicitly discusses meat, egg and dairy consumption. One aspect of problem structure that is particularly supportive of such an agreement is the relatively low cost: while implementing many of the strategies outlined in this report could cost many billion USD, adapting national dietary guidelines, education and public awareness initiatives in accordance with a revised WHO *Global Strategy* would be relatively inexpensive. Public concern, at least in European states, indicates that there is still room for improving awareness on the implications of livestock products. On the positive side, survey respondents indicated significant interest in healthy diets as well as sustainable consumption. Furthermore, scientific evidence on consumption of animal products remains somewhat inconsistent, which could be a barrier to agreement on an adapted *Global Strategy*. The most significant barrier to WHO dietary guidelines mentioning consumption of animal products is however the asymmetry of interest between powerful states and/or important states within the issue area: for example, due to the economic interests of countries with significant livestock sectors.

[61] Rules C5 and C6.
[62] Rule C8.

Summary: agreement on a WHO Global Strategy focusing on a diet low in animal products

- Overall feasibility: **VERY LOW** to **LOW**
- Even more so than the previous options, food and diet guidelines are issues that are generally addressed at the level of the state
- Increased cooperation is unlikely, as asymmetry of interest is high, in particular with respect to economic interests. Furthermore, differentiation of rules, or side-payments are unlikely within this mechanism.
- Other barriers include substantial cultural differences (homogeneity of states), and the fact that while there are scientific studies supporting dietary change for health benefits, they are not necessarily consensual and are not accepted by all governments.

9 Options for Reducing Global Biodiversity Loss: Mitigating Climate Change

Option 8

"Climate change mitigation: In this option, GHG emissions are assumed to be reduced by a mix of energy efficiency, renewable energy, nuclear power and carbon capture and storage but without bio-energy"

"Bio-energy intensive mitigation: climate change mitigation is achieved on the basis of the lowest mitigation costs, which includes ambitious use of bio-energy." (sensitivity variant)

"Mitigation with compact agriculture assumes the same bio-energy intensive mitigation scenario as in the previous option, but with simultaneous and rapid improvement in agricultural productivity. This would make it possible to produce bio-energy without large-scale conversion of natural areas" (sensitivity variant)

9.1 Existing Instruments to Mitigate Climate Change

Pressures from climate change also have significant implications for biodiversity loss. Thus, the potential consequences for biodiversity of scenarios where greenhouse gas concentration stabilization occurs at a level of 450 ppm (with or without bio-energy, increased agricultural productivity) have been evaluated (PBL 2010a).

There are multiple instruments that aim to contribute to climate change mitigation. The currently applicable instruments of cooperation at the global level are the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. The UNFCCC is an international treaty that broadly aims to contribute to a reduction and stabilization of greenhouse gas emissions by its signatories. As the name indicates, it is a framework treaty that itself does not specify greenhouse gas emissions reductions in detail. These were to be specified in subsequent protocols such as the Kyoto Protocol. This protocol specifies collective emissions reductions of six greenhouse gasses by at least 5% (relative to the 1990 baseline) for the Annex I countries.

Recent years have also seen the emergence of many market-based climate governance mechanisms, such as the voluntary carbon market, the EU Emissions Trading Scheme (EU ETS) and the Chicago Climate Exchange (CCX). These markets aim to contribute to reduced emissions by providing funding for projects that reduce, prevent, or sequester greenhouse gas emissions, or by implementing a cap-and-trade system for emissions.

Tools to contribute to climate change mitigation also exist outside the international treaty framework and these market mechanisms. The IPCC has identified that many technologies and similar measures that could contribute towards a decrease in greenhouse gas emissions already exist or will become available in the near future, such as not only bio-energy but also carbon capture and storage (CCS), renewable energy and nuclear power (IPCC 2007; PBL 2009). Further useful measures may involve efforts to reduce energy use and improve energy efficiency, such as improved building insulation and vehicle efficiency, as well as strategies such as reforestation and reduced deforestation (IPCC 2007; PBL 2009).

9.2 Selection of Instruments

The UNFCCC and the Kyoto Protocol as well as the other (potential) mechanisms addressing climate change mitigation are currently not ambitious or broad enough to encourage greenhouse gas concentration at 450 ppm: the Kyoto Protocol, for example, requires Annex 1 countries to reduce emissions by an average 5% relative to the 1990 baseline by 2012, while stabilization of GHG concentrations at 450 ppm would require a reduction of global emissions between 35 and 55% of 1990 levels by 2050 (EG Science 2008; PBL 2009). Given that a targeted greenhouse gas concentration of 450 ppm may already lead to significant damages in various areas, Rockström et al. (2009), for example, argue that CO_2 concentrations should not exceed 350 ppm), the urgency of the problem and inadequacy of current mechanisms is highlighted. Nonetheless, evaluating the likelihood successful implementation of the Kyoto Protocol, based on the rules defined in the ModelGIGS framework, gives an indication of the issues that would need to be addressed by a more ambitious successor agreement to the Kyoto Protocol. Furthermore, the outcomes of the Cancun COP16 meeting emphasized that parties should take action to keep temperature increase below 2°C, although the (voluntary) commitments in the agreement itself do not suffice to meet this target. Nonetheless, including such statements in the Cancun agreements suggests that future agreements may move further in the direction of the option. However, these agreements do not address several of the issues that are important to the climate change mitigation option variants, including bio fuel and agriculture.

These topics are of relevance to the study because of the potential trade-offs between many climate change mitigation strategies and biodiversity. Thus, for example, promotion of bio fuels may have substantial benefits in terms of reducing greenhouse gas emissions, however the expansion of farmland necessary for this poses a threat to biodiversity (PBL 2010a). This effect is not unavoidable, as for example increases in agricultural productivity can counteract such developments (PBL 2010a). Overall, the option variant that is considered most similar to their requirements therefore is the first one, excluding both bio-energy and agricultural production.

9.3 Applying the ModelGIGS Framework to the Kyoto Protocol

Problem structure

As discussed in the earlier cases, **high regulation costs** make regime implementation less likely.[63] In the case of climate change mitigation, regulation costs are probably significantly higher than for any of the other strategies discussed in this report. Thus, estimates for stabilizing greenhouse gas concentrations at 450ppm range from 1 to 3% of global GDP, or roughly 1200 billion USD annually (PBL 2009; UNEP 2008), although implementing the Kyoto Protocol is significantly less costly. However, it has been emphasized that the cost of climate change mitigation rises significantly the longer action is delayed, and that even though spending 2 or 3 % of global GDP on climate change mitigation may seem high, global military spending is similarly high at 2.5% (IPCC 2007; Stern 2006; UNEP 2008).

Actors

A further issue that may affect regime implementation negatively is the **large number of economic sectors** that is needed for effective regulation.[64] For example, for the

[63] Rule E2.
[64] Rule F4.

year 2000 the most significant contributions to greenhouse gas emissions were assumed to come from transportation, 13.5%; electricity and heat, 24.6%; land use change, 18.2%; and agriculture, 13.5% (UNEP 2008: 44; WRI 2005). Thus, regarding the number of sectors that need to be regulated, this option also far exceeds the other strategies discussed in this report.

A further issue that may impede implementation is the **asymmetry of interest** between **powerful states** and/or **important states within the issue area**,[65] which can however be ameliorated by **differentiation of rules**.[66] In the case of climate change mitigation, multiple dimensions of asymmetry impede agreement between states, involving issues such as the differing responsibilities and capabilities of states.

Determining responsibilities and commitments for emissions reductions is not necessarily straightforward, as demonstrated by the negotiations in Copenhagen in December 2009. For example, countries such as China and India were taken aback by the demand to make commitments emissions reductions as well. However, while China is the biggest emitter of greenhouse gasses even ahead of the United States, China's per capita emissions are only a fraction compared to the United States (4.62 tons and 19.70 tons per capita in 2006, respectively (UN Statistics 2009)). As this indicates, allocating responsibility is not uncomplicated. Furthermore, China highlights its concern that committing to emissions reductions will impede its development. Therefore, China and India were willing to agree to reduce the carbon intensity of their economies, without promising absolute emissions reductions, and emphasizing that responsibility should not be shifted onto developing countries, but rather focus on developed countries implementing their existing commitments. At the same time, this discussion highlights the economic interests that are touched upon by the current climate regime and negotiations on a successor agreement to the Kyoto Protocol, with developed countries fearing "substantial disadvantages for their economic prospects and competitiveness if they agree on mandatory emissions reductions without similar obligations for major developing countries" (Busch 2009: 254). These issues set the stage for difficult negotiations at Copenhagen, and the blaming that began after the failed conference highlights the different perceptions and interests. Nonetheless, the emphasis within the Kyoto Protocol and UNFCCC is generally on differentiation of rules, based on the "common but differentiated responsibilities and respective capabilities" of states, for example with only Annex 1 countries committing themselves to greenhouse gas emissions reductions under the Kyoto Protocol. In spite of such asymmetries, at the most recent climate negotiations in Cancun in December 2010, participating states adopted an agreement that was widely interpreted as a confirmation of the UNFCCC and paving the way for a continuation of the Kyoto Protocol (Akanle 2010). A further positive outcome was the fact that the meeting managed to reach an agreement that reconciled asymmetries between particularly important and/or powerful states, such as the United States and China. Objections came from one state, Bolivia, yet a decision by the COP-16 Presidency to focus on consensus rather than unanimity allowed for the agreements to be adopted nonetheless.

Asymmetry between states also exists in terms of their vulnerability to climate change, as well as their capacity to respond and adapt to it. Thus, developing countries "are especially vulnerable to climate change because of their geographic exposure, low incomes, and greater reliance on climate sensitive sectors such as agriculture" (Stern

[65] Rules F8 and F9.
[66] Rules G2 and G3, Rule G9.

2007: 104). The Kyoto Protocol addresses these issues to some extent via side-payments, which will be elaborated on below.

Regime design

Regime mechanisms that increase scientific knowledge generation, synthesis and dissemination are likely to increase regime implementation. This is an area that has received significant amounts of attention in the context of the climate regime, for example through the establishment of the Subsidiary Body on Scientific and Technological Advice (SBSTA). Furthermore, the bodies of the climate regime consult the scientific advice provided by the Intergovernmental Panel on Climate Change (IPCC).

Regimes tackling collaboration problems have an increased likelihood of implementation if they include **strong compliance mechanisms**.[67] In the case of the Kyoto Protocol, Article 18 calls on its signatories to define "appropriate and effective procedures and mechanisms to determine and to address cases of non-compliance with the provisions of this Protocol, including through the development of an indicative list of consequences, taking into account the cause, type, degree and frequency of non-compliance". In particular, Annex 1 parties must comply with their emission targets, and "the methodological and reporting requirements for greenhouse gas inventories" (UNFCCC 2010: 1). These greenhouse gas inventories are not only a significant part of checking for (non-)compliance, they are also part of the climate regime's **mechanism for regular reporting and implementation review**, a further issue that is identified as contributing to an increased likelihood of regime implementation in the ModelGIGS framework.[68] Greenhouse gas inventories are to be compiled using the agreed methodologies developed by the IPCC and in a common format, to ensure comparability (Yamin and Depledge 2004: 333-8).

The implications of non-compliance involve parties having to make the missed emissions reductions in the following commitment period as well as an extra 30%, to present a compliance action plan, and its right to take part in emissions trading is temporarily suspended (UNFCCC 2010). Such compliance action plans and suspension of eligibility for emissions trading also apply to parties failing to comply with reporting requirements.

Side-payments also make regime implementation more likely,[69] and in the Koto Protocol they are also intended to address the issue of different capabilities between states to implement an agreement and adapt to the problem of climate change. Thus, based on their emissions and capacity to cope, the UNFCCC and the Kyoto Protocol "mandate financial and technological transfers from Parties with more resources to those less well endowed and more vulnerable" (Yamin and Depledge 2004: 264). The paragraphs of Article 4 in the UNFCCC require the provision of financial resources to aid in implementation, reporting, adaptation and technology transfer, while similar rules also apply under Article 11 of the Kyoto Protocol. While neither document specifies the amount of funding to be provided, this was to be specified in greater detail in subsequent agreements. Overall, side-payments generated through the Clean Development Mechanism (CDM) of the Kyoto Protocol (amounting to 22 billion USD for climate change mitigation activities in developing countries between 2004-2008), have also been compared favourably to the funding mechanisms of other regimes, such as the CBD (UNEP/CBD/SP/PREP/1: 16).

[67] Rule G4.
[68] Rule G11.
[69] Rule G5.

The targets of the Kyoto Protocol are also **legally binding**, which is one aspect that increases the likelihood of regime implementation.[70] However, whether a second Kyoto Protocol commitment period is agreed upon, and to what extent this will be legally binding, is not certain. At COP-16, a continuation of the Kyoto Protocol with legally binding emissions commitments was highlighted, by many developing countries, as a condition for continuing climate negotiations (Akanle 2010). However, the language on both the continuation of the Kyoto Protocol and its legal nature was deliberately left open, although the Cancun Agreement does pave the way for a second commitment period.

A **strong autonomous regime secretariat** can also aid implementation.[71] However, while the climate secretariat has a substantial budget, its autonomy is limited. Thus, many countries object to a strong and autonomous climate secretariat, based on the significant asymmetries of interest. Thus, "most parties do not want a strong and independent climate secretariat, which (…) possibly favours the interests of one group of parties over those of another", and may have significant social and economic consequences for the affected countries (Busch 2009: 254). Considering the divergent interests of different parties, the climate secretariat has a difficult task finding a middle ground and is limited to being a "technocratic bureaucracy" (ibid: 260), and is reluctant to develop its own policy proposals (Biermann and Siebenhüner 2009: 329).

The ModelGIGS framework also indicates that **voting systems based on consensus or unanimity** may lead to weaker decisions in regime implementation, which decreases regime implementation.[72] Decisions under the UNFCCC have to be taken by consensus, which can present a significant challenge due to the more than 190 parties involved. As some scholars have highlighted, this not only impedes any change of voting rules, as these would also require consensus, but also lead to agreements that are "sometimes formulated vaguely to accommodate everyone. Such unclear agreement needs clarification at later date. Hence, more and more different topics are being discussed and a complicated structure of topics evolves" (Höhne et al. 2002: 10). As mentioned earlier, while the desire to reach a unanimously supported agreement is one of the issues that blocked the COP-15 Copenhagen negotiations, voting requirements were interpreted more loosely at COP-16, highlighting that consensus does not necessarily require unanimity (Akanle 2010). This flexibility allowed for an agreement to be reached despite opposition by Bolivia.

Regime environment

The climate regime has both potential **positive** and **negative interactions** with other regimes, which could reinforce or undermine regime implementation, respectively.[73]

Indeed, it has been highlighted that the wide scope of the climate regime makes interactions with numerous other international institutions unsurprising (Oberthür 2006: 53). In addition to numerous possible direct interactions, for example with the CBD (encouraging plantations under the Kyoto Protocol would be undesirable for forest biodiversity), more diffuse potential interactions exist as well, including for example that "trade liberalization advanced by the World Trade Organization (WTO) may lead to rising GHG emissions due to induced growth in international trade" (Oberthür 2006: 56).

[70] Rule G8.
[71] Rule G10.
[72] Rule G12.
[73] Rules H2 and H3.

Other interactions with WTO law were identified by Zelli and van Asselt (2010). One potential area of interplay are the flexibility mechanisms in the Kyoto Protocol: thus, for example the provisions on international emissions trading are directed at developed countries, and "could be considered a form of trade discrimination since it effectively excludes the large majority of developing countries as well as third parties to the Kyoto Protocol from emissions trading" if emissions credits were considered to fall under the GATT (Zelli and van Asselt 2010: 81). Furthermore, various trade-related policies could be in conflict with WTO law, for example government procurement policies permitted under the climate regime, and implemented to achieve emissions limitations could also be in conflict with WTO rules on this issue (ibid: 83). However, the authors also identify possible positive interactions, such as "the removal of trade barriers in favour of climate-friendly goods or services, and the development and transfer of low-emission technologies" (ibid: 84).

In summary, numerous factors affect the implementation of the current climate regime, indicating issues that could be improved or built upon by a more ambitious successor agreement to the Kyoto Protocol. Two significant obstacles are the substantial regulation costs involved with implementing a successful climate agreement, as well as the significant number of economic sectors affected by climate policies. A further obstacle is the asymmetry of interest both between powerful and important states within the issue area, which is however to some extent addressed with differentiation of rules. The interactions with other regimes, such as the WTO, could have both negative and positive implications.

In terms of regime design, the UNFCCC and Kyoto Protocol incorporate various elements that have been identified as conducive to regime implementation (Dellas et al. 2011). These include a relatively strong compliance mechanism, mechanisms for reporting and implementation review, and rules encouraging side-payments. However, there is also room for improvements with respect to regime design: for example, the secretariat is identified as weak, and the voting system encourages broad and vague agreements.

Summary: implementation of the UNFCCC and its Kyoto Protocol

- Overall feasibility: **MODERATE** to **HIGH**
- Among the factors encouraging implementation are the regime design components, including a strong compliance mechanism, mechanisms for reporting and implementation review, side-payments and differentiation of rules. Weaker aspects of regime design are the weak secretariat and the voting system.
- Other impediments are significant, in particular the substantial regulation costs as well as the number of economic sectors affected. Asymmetry of interest is also considerable, although this can and has to some extent been addressed by differentiation of rules.
- As this regime covers a wide range of issues and sectors, the number of possible positive and negative interplay with other (environmental) regimes is also high and needs to be addressed to maximize the positive and limit the negative interplay.
- However, it may be important to note that even with suitable conditions for implementation, the gap between the level of ambition of the obligations and the requirements of the option (GHG concentration stabilization at 450ppm) appears to be significantly larger than in most other options.

10 Conclusions and Linking Strategies

The analysis in the previous section highlighted that some strategies for reducing global biodiversity loss have a higher likelihood of successful cooperation and implementation, which does not necessarily correspond to their desirability in terms of the amount of biodiversity loss that is prevented. Thus, the following diagrams summarize the results for regime formation and regime implementation regarding the eight options. The colours indicate whether the evaluation regarding each rule was mostly positive (green), negative (red), ambiguous/balanced (yellow), or if information was lacking or the rule not applicable (white). However, as will be discussed in more detail in the evaluation of the ModelGIGS framework, several issues necessitate caution when comparing the cases and the importance of each of the factors in each case. For example, it is currently not possible to indicate what the weighting of each factor is: are low regulation costs more or less conducive to regime implementation than side payments, or are they equally important? Since we currently lack information on such issues, each factor was assumed to have the same importance.

As the diagrams indicate, among the **regime formation** cases reducing deforestation (REDD+) is most promising, as the barriers to increased cooperation in this area are not too high (indicated by an absence of red boxes), while there are some issues that are clearly conducive to regime formation, such as differentiation of rules. Conversely, for the three options in the bottom two rows (agricultural productivity, reducing post-harvest losses and dietary change) the evaluation of none of the rules comes to a straightforward positive conclusion, while there are a number of rules where the evaluations are ambiguous, or indicate clear obstacles to regime formation. Forest certification and fisheries certification make up the middle ground, with fewer serious obstacles, but also fewer factors that would indicate a high likelihood of states agreeing to endorse certification schemes.

In the **regime implementation** cases, ranking the options is less straightforward. The protected areas option (CBD) appears to have the highest likelihood of regime implementation, based on the fact that several factors are particularly favourable to this, while only one definite barrier (lack of sanctioning power) emerges. Implementation of the climate change mitigation option (Kyoto Protocol) is less likely: while there are also several factors that indicate conditions that are favourable to implementation, mostly relating to regime design, there are also several issues that pose serious obstacles. Moreover, fisheries and forest certification again make up the middle ground, with fewer rules indicating particularly favourable conditions or strong obstacles to implementation. The lack of strong statements in these cases is probably related to the fact that both fisheries and forest certification are conducted by a diverse set of certification schemes, thus there is a strong internal divergence regarding many of the rules.

I. Regime Formation	CBD	REDD+	FSC	MSC	FAO	WHO	UNFCCC & Kyoto
A. Problem Structure							
A1. The higher the regulation costs, the less likely is regime formation.		moderate	low	low	depends on measures taken	low	
A2: High public concern for the problem increases likelihood of regime formation.		n/a	high	high	concern about some agricultural practices	low, however increasing interest in sustainable consumption in some regions	
A3. Systemic problems increase the likelihood of regime formation.		n/a	n/a	n/a	n/a	n/a	
A4. Cumulative problems decrease the likelihood of regime formation.		cumulative	cumulative	cumulative	cumulative	cumulative	
A5. Scientific uncertainty decreases the likelihood of regime formation.		yes, but ongoing trials and research	some scientific uncertainty, but growing consensus	some scientific uncertainty, but growing consensus	pathyways to change unknown	moderate	
A6. In case of a collaboration problem, regime formation is less likely.		collaboration	collaboration	collaboration	coordination	coordination	
B. Negotiation Process							
B1. The higher the negotiation costs, the less likely is regime formation.		n/a	n/a	n/a	n/a	n/a	
B2. If a problem is marked with great asymmetry of powerful states' interests, differentiation of rules increases likelihood of regime formation.		yes	high asymmetry, inadvertent differentiation of rules	high asymmetry, some differentiation of rules	asymmetry, no negotiations	asymmetry, no negotiations	
B3. If a problem is marked with great asymmetry of interest between important states within the issue area, differentiation of rules increases likelihood of regime formation.		yes	high asymmetry, inadvertent differentiation of rules	high asymmetry, some differentiation of rules	asymmetry, no negotiations	asymmetry, no negotiations	
B4. In case of a collaboration problem, the more side-payments are made available, the more likely is regime formation.		collaboration problem, side-payments available but funding mobilization unclear	n/a	collaboration problem, discussions on side-payments	n/a	n/a	
C. State and other Actors							
C1. In case of a systemic environmental problem, non-support of one or more important states within the issue area, decreases likelihood of regime formation.		n/a	n/a	n/a	n/a	n/a	
C2. In case of a cumulative environmental problem, the more of the important states within the issue area support a regime, the more likely is regime formation.		cumulative, support is varied	cumulative, support is varied	cumulative, support is varied	n/a	cumulative/little support	
C3. Great asymmetry of powerful states' interests decreases likelihood of regime formation.		moderate, substantial issues need to be resolved	high, north-south divide	high, north-south divide	high	high	
C4. Great asymmetry of interest between important states within the issue area decreases likelihood of regime formation.		moderate, substantial issues need to be resolved	high, north-south divide	high, north-south divide	high	high	
C5. If almost all powerful states support regime formation, then regime formation is more likely.		moderate, substantial issues need to be resolved	has been objected by some states	has been objected by some states	n/a	low	
C6. If almost all important states within the issue area support regime formation, then regime formation is more likely.		moderate, substantial issues need to be resolved	has been objected by some states	has been objected by some states	n/a	low	
C7. The fewer economic sectors are needed to regulate an environmentally harmful activity, the more likely is regime formation.		low	low	low	moderate	moderate	
C8. If the states needed to regulate a harmful activity are homogeneous, then regime formation is more likely.		not homogenous	not homogenous	not homogenous	not homogenous	not homogenous	
D. Regime Environment							
D1. The existence of a preceding international agreement dealing with the same or a similar problem enhances the likelihood of regime formation.		yes	yes	yes	no	no	
D2. Consensual scientific information by scientific advisory bodies increases the likelihood of regime formation.		yes, ongoing research to reach consensus	n/a	FAO guidelines	research initiatives such as IAASTD & CGIAR	n/a	

Figure 10.1 Overview results regime formation cases

II. Regime Implementation	CBD	REDD+	FSC	MSC	FAO	WHO	UNFCCC & Kyoto
E. Problem Structure							
E1. In case of a collaboration problem, regime implementation is less likely.	collaboration		collaboration	collaboration			collaboration
E2. The higher the regulation costs, the less likely is regime implementation.	low		low	low			high
E3. Systemic problems increase the likelihood of regime implementation.	n/a		n/a	n/a			systemic
E4. Cumulative problems decrease the likelihood of regime implementation.	cumulative		cumulative	cumulative			n/a
F. Actors							
F1. Participation of high-level government representation in COPs increases likelihood of regime implementation.	yes (not consistent)		n/a	n/a			yes
F2. If almost all powerfull states participate in a regime, then regime implementation is more likely.	high		not all participate	not all participate			not all participate
F3. If almost all important states within the issue area participate in a regime, then regime implementation is more likely.	high		not all participate	not all participate			not all participate
F4. The fewer economic sectors are needed to regulate an environmentally harmful activity, the more likely is regime implementation.	low		low	low			high
F5. In case of a systemic environmental problem, non-participation of one or more important states within the issue area, decreases regime implementation.	n/a		n/a	n/a			Systemic/non-participation of e.g. U.S.
F6. In case of a cumulative environmental problem, the more of the important states within the issue area participate in the regime, the more likely is regime implementation. [F7. Outvoting of important states within the issue area decreases regime implementation.]	cumulative/important n/a		cumulative/participation inconsistent n/a	cumulative/participation inconsistent n/a			n/a n/a
F8: Great asymmetry of interest between powerful states decreases likelihood of regime implementation.	low		high, north-south divide	high, north-south divide			High asymmetry, north-south, responsibilities, economic interest.
F9: Great asymmetry of interest between important states within the issue area decreases likelihood of regime implementation.	low		high, north-south divide	high, north-south divide			High asymmetry, north-south, responsibilities, economic interest.
G. Regime Design							
G1. Regime mechanisms that increase scientific knowledge generation, synthesis and dissemination are likely to increase regime implementation.	considered credible,neutral		n/a	n/a			yes
G2. If a problem is marked with great asymmetry of powerful states' interests, differentiation of rules increases likelihood of regime implementation.	possible asymmetry, differentiation		high asymmetry, inadvertent differentiation of rules	high asymmetry, some differentiation of rules			High asymmetry on many dimensions, but rule differentiation somewhat mitigating
G3. If a problem is marked with great asymmetry of interest between important states within the issue area, differentiation of rules increases likelihood of regime implementation.	possible asymmetry, differentiation		high asymmetry, inadvertent differentiation of rules	high asymmetry, some differentiation of rules			High asymmetry on many dimensions, but rule differentiation somewhat mitigating
G4. In case of a collaboration problem, regime implementation is more likely if there is a strong compliance mechanism.	collaboration/weak compliance mechanism		no	no			collaboration/strong compliance mechanism
G5. Regime implementation is more likely if there are side-payments.	yes, but lacks mobilization		n/a	discussion on side-payments			yes
G6. In case of a coordination problem, regime implementation is less likely without a strong information and communication mechanism.	n/a		n/a	n/a			n/a
G7. The more precise the rules of a regime are, the more likely is regime implementation.	yes, but could improve indicators		yes, but not necessarily regarding biodiversity	lack of precision criticised for some certification schemes			yes
G8. Legally binding rules increase the likelihood of regime implementation.	yes		no	no			yes
G9. Differentiated rules increase the likelihood of regime implementation.	yes		yes, inadvertent	some differentiation according to fisheries capabilities			yes
G10. The existence of a strong autonomous secretariat increases the likelihood of regime implementation.	secretariat is effective and influential		n/a	n/a			considered weak
G11. Mechanisms for regular reporting and implementation review increase the likelihood of regime implementation. [G12. Voting systems based on consensus or unanimity lead to weaker decisions in regime implementation, which decreases regime implementation.]	yes, but not consistent n/a		yes n/a	yes n/a			yes; precise and mandatory reporting n/a
H. Regime Environment							
H1. The embedding of a regime in a larger institutional framework increases the likelihood of regime implementation.	n/a		n/a	n/a			n/a
H2. Negative interplay with other regimes decreases regime implementation.	yes		yes	yes			yes
[H3. Positive interactions with other regimes increase regime implementation.]	yes		yes	yes			yes

Figure 10.2 Overview results regime implementation cases

Based on the summary in the previous two paragraphs, the following conclusions can be made. Firstly, the options regarding agricultural productivity, reducing post-harvest losses and in particular dietary change currently face many obstacles, and are unlikely to lead to suitable agreements in the near future. Secondly, focusing more on increasing cooperation on fisheries and forest certification may be useful: they have clear potential regarding successful implementation, and the obstacles towards increased cooperation in this area are manageable. Lastly, the clearest potential is in the options on climate change mitigation, protected areas and reducing deforestation. Thus, focusing more on these issues could be more feasible from the perspective of regime formation and regime implementation.

As the analysis of the various mechanisms according to the ModelGIGS rules indicated, many of the barriers to regime formation or implementation are similar across the different options. In particular, asymmetry of interest between developed and developing countries emerge in many options, such as climate change mitigation and certification schemes, but also increasing agricultural productivity/reducing post-harvest losses. These asymmetries arise because responsibilities for causing an environmental problem, as well as the vulnerability to its impacts and the capability to address it are not equally distributed among states. In fact, in many cases those actors that are least responsible for a problem are also more vulnerable to its impacts and less capable to address them, However, in most cases, such asymmetries can at least partially be mitigated by differentiation of rules, as this allows the cost of addressing an environmental problem to be concentrated on those actors that are most responsible for it. Furthermore, side-payments can contribute towards agreement and implementation by providing funding for implementation, and incentives.

In other areas, the factors affecting likelihood of regime formation or implementation diverge more significantly. Thus, in terms of problem structure, regulation costs and number of economic sectors that need to be regulated differ substantially, from relatively low in the case of certification schemes, where most costs currently fall on private companies applying for certification, up to (high estimates of) 3% of global GDP for climate change mitigation. Such differences highlight the benefits of examining different pressures on biodiversity loss individually, as it allows us to be aware of the variations in problem structure, actor interests etc. affecting the different issues, and necessitating different approaches for cooperation.

In terms of reducing biodiversity loss, the options that are able to provide the greatest impact are not necessarily the ones that are also politically most feasible. Thus, the option with the greatest potential reduction in biodiversity loss is dietary change (PBL 2010a). However, this option also happens to be the one where global cooperation is least likely (and, for various reasons, action at the national level is likely to remain limited as well). Comparing the potential of options to reduce biodiversity loss according to PBL (2010) with the results from this study indicates that the options which score higher in terms of regime formation or implementation tend to have a less dramatic impact on reducing biodiversity loss, while some of the options with the most considerable impact also face substantial regime formation or implementation obstacles. The graph below compares these rankings to each other (Figure 10.3). It shows only the overall results (in terms of prevented mean species abundance (MSA) loss) for the option variants that were discussed in this report, and colour-codes them to demonstrate which options have a higher or lower likelihood of regime formation or implementation.

The key conclusion to be drawn from a comparison of the results from these two studies is that rather than focusing on the strategy that is 'ideal' for reducing global biodiversity loss (such as dietary change), policymakers also need to consider which instruments are attainable and enforceable, especially since the 'ideal' instrument is often contentious and complex.

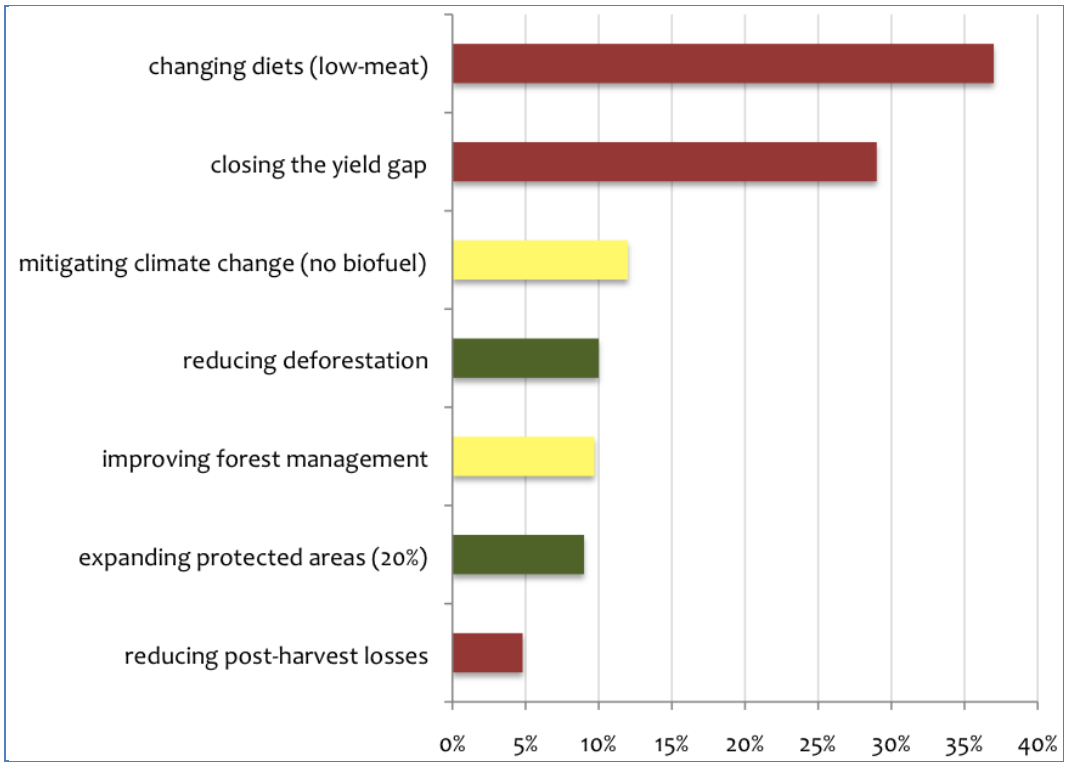

Figure 10.3 Comparing prevented biodiversity loss of options with feasibility of regime formation/implementation. The graph ranks options according to prevented loss of biodiversity (based on PBL 2010a: 104), while the colours are used to signal relative feasibility of regime formation or implementation (red: regime formation/implementation likelihood low, yellow: regime formation/implementation likelihood moderate, green: regime formation/implementation likelihood high).

10.1 Linking Strategies: Broad Issue Coverage

None of the options discussed in PBL (2010a) alone can halt biodiversity loss, and similarly the mechanisms and regimes to implement the various options that were discussed in the previous chapter can only make partial contributions to reducing biodiversity loss. Combining the strategies could therefore lead to a more significant reduction, especially since they address different drivers in biodiversity loss.

While implementing all of the strategies at once seems unlikely, many of the individual options address touch upon other issues. The following paragraphs will therefore examine the potential overlaps each of the eight strategies has with the mechanisms of the other strategies. It needs to be noted that these links are only addressed in the context of the options discussed in this report, for example while the various components of the CBD link to many issues, including multiple other options, only the links of the component discussed in this report (protected areas) are discussed here. Such interaction is often one-way: while a mechanism may contribute to action in other

areas, this does not necessarily mean that mechanisms in those other areas also contribute to action in the first one.

In the case of the work of the **Convention on Biological Diversity** on protected areas, there is a clear overlap with REDD+, as forests are among the ecosystem types that are to be protected under the CBD. Furthermore, the CBD Strategic Plan until 2020 highlights the protection of forests (particularly target 5 of the CBD Strategic Plan).

Similarly, the **UNFCCC and its Kyoto Protocol** are also linked to REDD+, albeit for different reasons. Thus, negotiations on REDD+ primarily occur in the context of the UNFCCC, as forests are a significant area for carbon storage.

Thus, **REDD+** overlaps with both the options listed above, and "the potential of REDD for synergies among the Conventions has been recognized by both the UNFCCC and the CBD in decisions of their Conferences of the Parties" (UNEP/CBD/WS-REDD/1/2: 10). However, both conventions have also recognized that the precise goals and design of the REDD+ mechanism are important for ensuring that these synergies are positive, as REDD+ could potentially also have negative implications for the objectives of the CBD if the focus is exclusively on forests as carbon sinks (UNEP/CBD/WS-REDD/1/2: 10).

Although somewhat more indirectly, **forest certification** also links to REDD+ and CBD protected areas, since certification programs often require that firstly, natural forests not be converted for commercial forestry, and secondly, they generally require that forestry companies set aside some of their land for forest conservation. Thus, it "is not surprising that the FSC certification started to be recognized also as a climate change mitigation tool" , and there are discussions on adapting certification standards and including carbon accounting methodologies (Brotto et al. 2010: 16-17).

Similarly to forest certification, **marine certification** is also linked to CBD protected areas to some extent, as both may involve the establishment of marine protected areas. However, it must be noted that these are specifically not included in the option on protected areas discussed in this report, as this focuses on protection of terrestrial eco-regions.

In the case of **increasing agricultural productivity**, **reducing post-harvest losses**, and **dietary change**, the strategies discussed in this report are at least partially related to each other. Thus, for example programs by FAO that address agricultural productivity also often involve reducing post-harvest losses, and vice versa. However, none of these three options have significant direct interactions with the other strategies discussed in this report. At the same time, it is important to highlight that implementation of any of these three options could have a significant indirect potential to enhance the outcomes of the other options as they reduce the pressures for expansion of agricultural land. For example, less expansion of agricultural land reduces the possibility of leakage with the establishment of protected areas under the CBD, or the protection of forested areas through REDD+ (PBL 2010a).

Overall, REDD+ has the potential to touch on most options at once. In terms of reducing biodiversity loss, the REDD+ option covers some of the issues that are in the 'middle ground': it does not include dietary change and increasing agricultural productivity, which have the most potential to reduce global biodiversity loss, but it touches on the issues of climate change mitigation, reducing deforestation, sustainable forest management and expanding protected areas. However, it is of course worth noting that REDD+ does not cover many of these options fully, as expanding protected areas, for example, includes far more eco-regions than forests and woodlands. Nonetheless, these interactions indicate significant room for

synergies, particularly as REDD+ and the options it is related to are among the more politically feasible options.

10.2 Linking Strategies: Win-Win Outcomes

The strategies included in this report can also be linked in other ways. One approach would be to include various co-benefits that each of the strategies may have, in areas such as development and poverty reduction. Another approach could be to assess the extent to which a strategy addresses underlying issues such as land use change or climate change. These issues would also be interesting to include in the evaluation, as they are likely to change the outcomes substantially (since some issues have substantial impacts on multiple possible co-benefits, while in other cases this is far more limited).

However, it was decided not to include this in the evaluation for several reasons. Firstly, the choice of co-benefits that would be included inherently affects to what extent the scoring on each regime shifts. Is health a co-benefit, hunger, poverty, and trade? This is especially problematic since many of the co-benefits overlap. Therefore, it is difficult to say which ones should be included and which ones not. Secondly, it is unclear in what direction the co-benefits will impact the scoring, as there is no indication in the relevant literature on these issues. For example, one could assume that an issue that addresses multiple co-benefits has an increased likelihood of regime formation, as policymakers are interested in such synergies that allow multiple issues to be targeted by one instrument. Furthermore, such co-benefits help frame the issues in a particular way, and put them on the agenda. Conversely, it is also possible that issues that touch on more, especially socio-economic, issues are *less* likely to experience regime formation. For example, issues such as establishing protected areas, which can be done without requiring many policy changes in other areas or significant behavioural changes, have experienced rather successful regime formation and implementation, while issues such as dietary change, which would have substantial co-benefits on areas such as poverty, health, development, climate change but also require substantial policy and behavioural changes, have received far less support for regime formation. Essentially, interactions with too many other issues could make agreements more complex and make regime formation problematic.

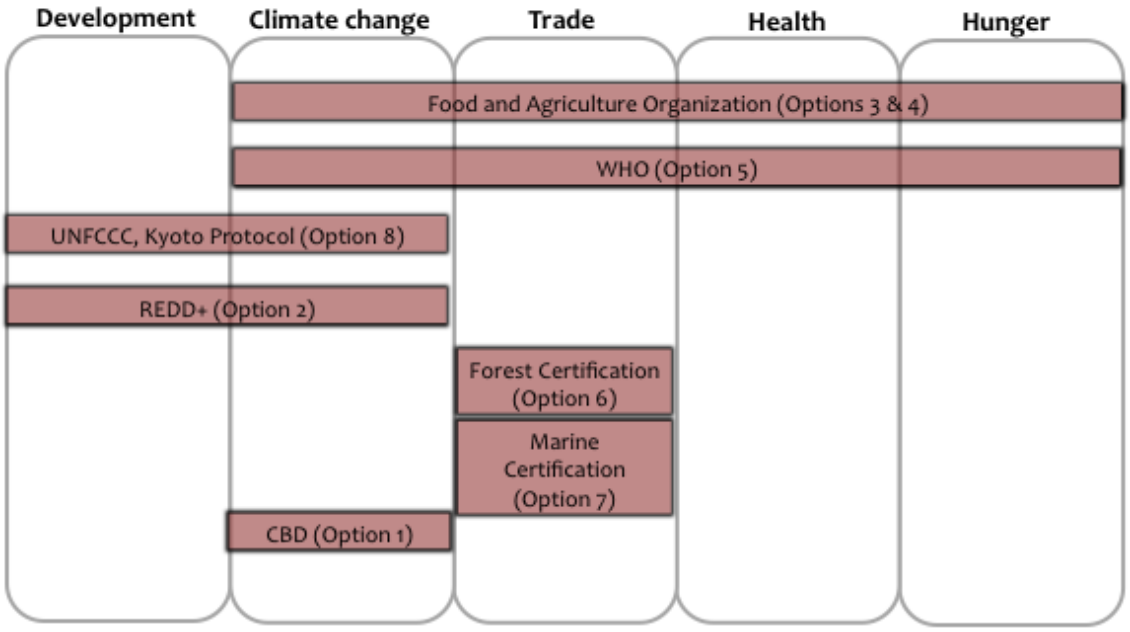

Figure 10.4 Examples of cross-cutting issues

10.3 The ModelGIGS Framework: Conclusions

The results presented in this report also necessitate a reflection on the framework that was used, and in particular the drawbacks and uncertainties it raises that need to be resolved by future research. Firstly, an important observation is that simply because the report evaluates that an issue is generally characterized by a lot of positive attributes, this does not mean that it is being negotiated or highly visible on the international agenda. However, it does suggest that if policymakers focus more attention on an issue with more favourable characteristics, they are more likely to be able to reach an agreement or implement the solution. Based on this observation, one can recommend a stronger focus on the expansion of protected areas and protection of all forested areas.

Secondly, the framework may not capture all aspects that are important for a particular option. For example, in the case of forest certification, issues that cannot be adequately discussed within the framework that may nonetheless be relevant include involvement by civil society and business involvement, as well as organizational structures. Furthermore, it may be useful to add more nuance to the model, for example to capture cost of inaction and benefits of regulation as well as the cost of regulation as part of the problem structure.

Thirdly, the evaluations of the options allow for conclusions to be made regarding which of the options are more feasible for regime formation or regime implementation. However, comparison of the options is not straightforward. For example, one issue that is not addressed by the ModelGIGS framework in its current form is the weighting of the different rules: are all factors equally important, or do some issues have more of an impact on successful regime formation and implementation? While this seems likely, the international regime literature is neither precise nor consistent on the relative significance of aspects of problem structure, actors, negotiation process, regime environment and regime design. Thus, in this study we assume that each of the rules carries equal weight. A second factor making comparison problematic is that not all of the rules can be examined in equal detail for each of the options, as the amount of information available varies. Thus, in the ranking presented on the previous pages, issues for which we could not make a judgment on the basis of the available information were not included.

Fourthly, as was mentioned earlier, the instruments that are compared in this report are quite different, which also makes a systematic comparison difficult. In particular, comparing the importance of each issue that is discussed across the cases may be problematic. For example, does a high level of scientific uncertainty have the same impact on a small-scale, un-ambitious strategy to reduce biodiversity loss as it does for a large-scale, ambitious option? It might be that although such factors can constitute an impediment in both cases, they are easier to overcome in the case of a less ambitious instrument.

Lastly, the framework itself does not reflect whether the instruments that are examined have a beneficial impact on the problems they are trying to solve, as it focuses only on their output and outcome. Thus, in order to evaluate whether regime formation and implementation is worth pursuing, the potential impact of an option on the issue it aims to regulate also needs to be studied.

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Annex A List of Rules from ModelGIGS Framework

A.1 Note

Note: this annex only provides the rules used in the theoretical and conceptual framework. For full definitions and operationalisation of concepts, please see the original document by Dellas and colleagues (2011).The bracketed rules in the list below are the ones where the authors could not identify useful ways of operationalising the concepts, therefore they generally not examined in this report.

A.1.1 ModelGIGS Rules

I. Regime Formation

A. Problem Structure

A1. The higher the regulation costs, the less likely is regime formation.

A2. High public concern for the problem increases likelihood of regime formation.

A3. Systemic problems increase the likelihood of regime formation.

A4. Cumulative problems decrease the likelihood of regime formation.

A5. Scientific uncertainty decreases the likelihood of regime formation.

A6. In case of a collaboration problem, regime formation is less likely.

B. Negotiation Process

B1. The higher the negotiation costs, the less likely is regime formation.

B2. If a problem is marked with great asymmetry of powerful states' interests, differentiation of rules increases likelihood of regime formation.

B3. If a problem is marked with great asymmetry of interest between important states within the issue area, differentiation of rules increases likelihood of regime formation.

B4. In case of a collaboration problem, the more side-payments are made available, the more likely is regime formation.

[B5. In case of high transaction costs and scientific uncertainty, an initial framework treaty followed by more precise agreements increases likelihood of regime formation.]

[B6. If the environmental problem is considered urgent by a majority of actors, an initial informal agreement increases likelihood of regime formation.]

[B7. In case of cumulative cleavages, regime formation is more likely if there are positive or negative incentives.]

[B8. In case of a collaboration problem, regime formation is more likely if there are positive issue-linkages.]

[B9. In case of cumulative cleavages, regime formation is less likely.]

C. State and other Actors

C1. In case of a systemic environmental problem, non-support of one or more important states within the issue area, decreases likelihood of regime formation.

C2. In case of a cumulative environmental problem, the more of the important states within the issue area support a regime, the more likely is regime formation.

C3. Great asymmetry of powerful states' interests decreases likelihood of regime formation.

C4. Great asymmetry of interest between important states within the issue area decreases likelihood of regime formation.

C5. If almost all powerful states support regime formation, then regime formation is more likely.

C6. If almost all important states within the issue area support regime formation, then regime formation is more likely.

C7. The fewer economic sectors are needed to regulate an environmentally harmful activity, the more likely is regime formation.

C8. If the states needed to regulate a harmful activity are homogeneous, then regime formation is more likely.

[C9. If the environmental problem is considered urgent by the majority of states, then regime formation is more likely.]

[C10. If the coalition of 'pushers' is more powerful than the rest, regime formation is more likely.]

[C11. If the coalition of 'laggards' within a regime is more powerful than the rest, regime formation is less likely.]

D. Regime Environment

D1. The existence of a preceding international agreement dealing with the same or a similar problem enhances the likelihood of regime formation.

D2. Consensual scientific information by scientific advisory bodies increases the likelihood of regime formation.

[D3. Participation by stakeholders in decision-making increases the likelihood of regime formation.]

II. Regime Implementation

E. Problem Structure

E1. In case of a collaboration problem, regime implementation is less likely.

E2. The higher the regulation costs, the less likely is regime implementation.

E3. Systemic problems increase the likelihood of regime implementation.

E4. Cumulative problems decrease the likelihood of regime implementation.

F. Actors

F1. Participation of high-level government representation in COPs increases likelihood of regime implementation.

F2. If almost all powerful states participate in a regime, then regime implementation is more likely.

F3. If almost all important states within the issue area participate in a regime, then regime implementation is more likely.

F4. The fewer economic sectors are needed to regulate an environmentally harmful activity, the more likely is regime implementation.

F5. In case of a systemic environmental problem, non-participation of one or more important states within the issue area, decreases regime implementation.

F6. In case of a cumulative environmental problem, the more of the important states within the issue area participate in the regime, the more likely is regime implementation.

[F7. Outvoting of important states within the issue area decreases regime implementation.]

F8: Great asymmetry of interest between powerful states decreases likelihood of regime implementation.

F9: Great asymmetry of interest between important states within the issue area decreases likelihood of regime implementation.

G. Regime Design

G1. Regime mechanisms that increase scientific knowledge generation, synthesis and dissemination are likely to increase regime implementation.

G2. If a problem is marked with great asymmetry of powerful states' interests, differentiation of rules increases likelihood of regime implementation.

G3. If a problem is marked with great asymmetry of interest between important states within the issue area, differentiation of rules increases likelihood of regime implementation.

G4. In case of a collaboration problem, regime implementation is more likely if there is a strong compliance mechanism.

G5. Regime implementation is more likely if there are side-payments.

G6. In case of a coordination problem, regime implementation is less likely without a strong information and communication mechanism.

G7. The more precise the rules of a regime are, the more likely is regime implementation.

G8. Legally binding rules increase the likelihood of regime implementation.

G9. Differentiated rules increase the likelihood of regime implementation.

G10. The existence of a strong autonomous secretariat increases the likelihood of regime implementation.

G11. Mechanisms for regular reporting and implementation review increase the likelihood of regime implementation.

[G12. Voting systems based on consensus or unanimity lead to weaker decisions in regime implementation, which decreases regime implementation.]

[G13. Regimes with broad issue coverage are more likely to be implemented.]

[G14. Regime mechanisms that increase public awareness are likely to increase regime implementation.]

[G15 In case of a collaboration problem, regime implementation is more likely if there are positive side-payments.]

[G16. Sanction mechanisms within a regime increase likelihood of regime implementation.]

G17. An autonomous standing decision-body increases the likelihood of regime implementation.]

[G18. An ad-hoc decision-body or a regular meeting of the Conference of the Parties decreases the likelihood of regime implementation.]

H. Regime Environment

H1. The embedding of a regime in a larger institutional framework increases the likelihood of regime implementation.

H2. Negative interplay with other regimes decreases regime implementation.

[H3. Positive interactions with other regimes increase regime implementation.]

[H4. Participation by stakeholders in decision-making increases the likelihood of regime implementation.]

Annex B Glossary of Terms and Abbreviations

Asymmetry of interest: this refers to a situation where (important) actors have diverging views regarding the significance of a problem, its implications and how to address it. This is because they are impacted by its negative consequences to different extents.

Autonomous standing decision-body: a formal, institutionalized and independent forum where representatives within a regime make decisions.

Binding rules: these are explicit conditions of obligation. Conversely, rules that are not legally binding can take the form of recommendations and guidelines.

C40: Climate Leadership Group of Cities.

CBD: Convention on Biological Diversity.

CCX: Chicago Climate Exchange.

CGIAR: Consultative Group on International Agricultural Research.

CMS: Convention on Migratory Species.

Collaboration problem: this is a situation where all actors benefit from the regulation of an environmental problem, even though not all of them are obliged to bear the same costs.

Cleavages: these are divisions in the interests of negotiating parties of a regime. When negotiating parties align into rigid interest coalitions that agree on most issues, we refer to the situation as → **cumulative cleavages.** Where multiple overlaps in the interests of negotiating parties exist, we refer to this as → **cross-cutting cleavages.**

Compliance: is a situation where the behaviour of members to a regime fully conforms to its rules.

C**ompliance mechanism:** a tool used to enforce compliance with a regime, for example by threatening to impose sanctions on parties that do not conform to the rules of a regime.

C**onsensus rule:** this is a decision-making procedure where not all eligible parties have to explicitly agree with a measure, as is the case with unanimity. However, no party can disagree so strongly that it is willing to oppose the measure's adoption publicly and formally.

Coordination problem: this is a situation where all actors' interests converge, and it is only a matter of organizing the flow of information and communication in order to solve a problem.

COP: Conference of the Parties.

Cross-cutting cleavages: cleavages are cross-cutting when actors do not find that their interests align with one group of actors on all issues, but rather that they agree with one group on one issue, but ally with another group on other issues. In such a situation, there is room for bargaining, compromises and making deals.

Cumulative cleavages: Cleavages are cumulative when during the negotiations, rigid coalitions form among groups of actors, which have few overlapping interests. In this situation, negotiations are difficult.

Cumulative problem: this exists when the activities that cause an environmental problem are local, but so widespread that they nonetheless constitute a global problem.

Decision-making/Decision rules: these procedures specify the conditions that must be met for the decisions reached within the context of an international regime to be accepted as legitimate. Typical examples are simple or other types of majority rule, unanimity or consensus.

Differentiation of rules: this refers to the adoption of different measures and targets for different actors, depending on their specific contribution to an environmental problem.

EU ETS: European Union Emissions Trading Scheme

FAO: Food and Agriculture Organization of the United Nations

FCPF: Forest Carbon Partnership Facility

FSC: Forest Stewardship Council

Global (environmental) governance: politics that transgresses national borders, and is characterized in particular by the participation of non-state actors, the emergence of new governance institutions and mechanisms, and the fact that it crosses multiple governance levels and spheres.

High-level government representation: this includes involvement by ministers, prime ministers and other diplomats. When these high-ranking officials represent a state during regime negotiations, this give additional prestige and facilitate the implementation of the regime.

Homogeneity of actors: actors are homogenous when they have similar economic, geographical, cultural and political backgrounds, e.g. OECD/non-OECD countries. Regime formation is more likely among homogenous actors, as they may have similar preferences regarding the agreement in question.

IAASTD: International Assessment of Agricultural Knowledge, Science and Technology for Development.

Important states within the issue area: some states have a particular stake in the cause of the problem and/or its solution, and at the same time also possess the political and economic power to encourage or deter regime formation.

Information and communication mechanism: such tools are important to coordinate the exchange of information among the parties regarding the problem at hand.

International institutions: these can be defined as "a cluster of rights, rules, and decision-making procedures that gives rise to a social practice, assigns roles to participants in the practice, and guides interactions among occupants in these roles" (Young et al. 2008: xxii).

International organization: in difference to regimes, which tend to be issue-specific, the mandates of organizations can be broader. Furthermore, they may be quite institutionalized, with "personnel, offices, equipment, a budget, and, often, legal personality" (Young et al. 2008: xxii).

International regime: an international regime is a set of "implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations" (Krasner 1983: 2). In difference to international organizations, they tend to be issue-specific and do not have the capacity

to act as a unified actor. Both international organizations and regimes are sub-categories of international institutions.

Institutional Interplay: this refers to a process of interaction between regimes, international institutions, or different levels of governance in ways that influence their development and effectiveness.

ITTO: International Tropical Timber Organization.

ITQ: individual transferable quota.

IUCN: International Union for Conservation of Nature.

IVQ: individual vessel quota.

Larger institutional framework: this can be an overarching institution (such as WTO or IMO), which will help in implementing the regime.

MSA: Mean Species Abundance.

MSY: Maximum Sustainable Yield.

Monitoring/Verification Mechanism: these are tools used to evaluate to what extent regime members comply with the rules set out by a regime.

MSC: Marine Stewardship Council.

Negotiation costs: these are the time and resources invested into negotiation procedures during the initial stages of regime formation.

Negotiation process: the discussions and consultations that are held between different actors with the intention of concluding an international environmental agreement. Issues such as the number and type of actors involved influence this process, their interests, and the type of problem they are discussing.

Non-regime: an environmental issue on which governments have thus far not made any policy agreements, or where attempts at cooperation have failed. Dimitrov (2003) argued for a greater focus on 'non-regimes', as any attempt to understand the conditions of successful regime formation and implementation needs to also understand under which conditions cooperation fails.

PEFC: Programme for the Endorsement of Forest Certification Schemes.

Positive incentives: these encourage reluctant states to participate in an agreement. In particular, where non-compliance is the result of lacking capacity to do so, positive incentives in the form of financial assistance, transfer of technological expertise, or other bilateral assistance can increase compliance.

Powerful states: these are states that have the political and economic power to either encourage and/or impose regime formation.

Problem structure: this refers to the specific attributes of an environmental problem, which may influence to what extent a regime is deemed feasible as well as what type of rules and regulations are suitable to address it.

Qualified majority rule: this decision-making procedure requires agreement on a decision of any fraction beyond one half, such as 2/3 or 3/4 of eligible participants.

Preceding international agreement: **this refers to pre-existing policies addressing the same issues as a new regime, irrespective of whether the policy is still in force.**

REEEP: Renewable Energy and Energy Efficiency Partnership

REDD, REDD+: Reducing Emissions from Deforestation and Forest Degradation in Developing Countries

Regime design: the components and characteristics that characterize a particular regime. Regime design can involve issues such as the rules and regulations governing decision-making rules, the type of obligations, the role of the secretariat, and monitoring and reporting requirements.

Regime environment: this is the wider context influencing a regime during its negotiation and implementation, including other institutions, organizations and norms.

Regime formation: this is the stage where a new set of rules and regulations governing a particular problem is created.

Regime implementation: during this stage, the participants or addressees of a regime apply and adapt to the rules specified in a regime, and behavioural change takes place.

Regime secretariat: this is an autonomous body, which has adequate financial resources and develops policies.

Regulation costs: are the costs actors incur while managing an environmental problem and complying with the rules of a regime.

Reporting mechanisms: these are requirements for regime members to provide information on their activities contributing to a regime's implementation.

Sanctions: these are restrictions which are applied in the case of violation of an agreements' provisions, such as trade restrictions or the withdrawal of the privileges of membership to the agreement.

Scientific advisory body: a regime can appoint a group of scientists as an advisory body, which is expected to produce scientific assessments of the problem at hand.

Scientific uncertainty refers to having incomplete knowledge of the causes of the environmental problem, and its likely consequences upon the natural and human environment. In those cases constant research is needed in order to investigate scenarios and future projections of likely impacts.

Secretariat → see Regime Secretariat.

Side-payments→ see Positive incentives.

Simple majority rule: this requires the consent of 50 percent plus one of those eligible to participate in decision-making to agree for a decision to be legitimate and authoritative.

Stakeholder: an actor with an interest in the issue under consideration, for example because their livelihoods or economic interests are affected by it. In this report, 'stakeholder' is usually used to refer to non-state actors (business and civil society).

Systemic problem: this is when the activity that causes the environmental problem has a direct physical global impact, even though the activity in itself need not necessarily be of global scale.

Systems for Implementation Review (SIRs): these are rules and procedures governing how parties to international agreements exchange data, monitor activities, assess adequacy of commitments and handle poor implementation.

Unanimity rule: requires all of the participants to explicitly agree for a decision to be legitimate and authoritative.

UNCLOS: United Nations Convention on the Law of the Sea

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNFCCC: United Nations Framework Convention on Climate Change

UNFSA: United Nations Fish Stock Agreement

VCM: Voluntary Carbon Market

WTO: World Trade Organization